

June 13, 1968

APPROPRIATIONS UNDER THE STATE TECHNICAL SERVICES ACT OF 1965

Mr. MANSFIELD. Mr. President, I ask unanimous consent that the Senate proceed to the consideration of Calendar No. 1209.

The PRESIDING OFFICER. The bill will be stated by title.

The BILL CLERK. A bill (S. 3245) to extend for an additional 2 years the authorization of appropriations under the State Technical Services Act of 1965.

The PRESIDING OFFICER. The question is on agreeing to the request of the Senator from Montana. Without objection, it is so ordered.

The Senate proceeded to consider the bill (S. 3245) which had been reported from the Committee on Commerce, with an amendment, on page 1, line 6, after the word "following:", strike out ":", \$7,000,000 for the fiscal year ending June 30, 1969; and such amounts as may be necessary for the fiscal year ending June 30, 1970," and insert "\$7,000,000 for the fiscal year ending June 30, 1969; \$10,000,000 for the fiscal year ending June 30, 1970; \$10,000,000 for the fiscal year ending June 30, 1971."; so as to make the bill read:

S. 3245

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 10 of the State Technical Services Act of 1965 (15 U.S.C. 1360; 79 Stat. 682) is amended by striking the period at the end of subsection (a) and inserting the following: "\$7,000,000 for the fiscal year ending June 30, 1969; \$10,000,000 for the fiscal year ending June 30, 1970; \$10,000,000 for the fiscal year ending June 30, 1971."

The PRESIDING OFFICER. The question is on agreeing to the committee amendment.

The amendment was agreed to.

Mr. MANSFIELD. Mr. President, I ask unanimous consent to have printed in the RECORD an excerpt from the report (No. 1231), explaining the purposes of the bill.

There being no objection, the excerpt was ordered to be printed in the RECORD, as follows:

PURPOSE OF THE LEGISLATION

S. 3245 amends the State Technical Services Act of 1965 by extending the period of authorization of appropriations an additional 2 years. The bill would authorize appropriations of \$7 million for the fiscal year ending June 30, 1969, and such amounts as may be necessary for the fiscal year ending June 30, 1970. The bill would permit continuance of the matching grants program to the States in furtherance of the present cooperative effort to promote the wider diffusion and more effective application of the findings of science and technology throughout American commerce and industry. The technical-services program would continue to draw upon the resources of universities, nonprofit research organizations, and State and local agencies, in locally planned and administered technical services designed to place these findings usefully in the hands of local businesses and enterprises.

The PRESIDING OFFICER. The question is on the engrossment and third reading of the bill.

The bill (S. 3245) was ordered to be engrossed for a third reading, read the third time, and passed.

The title was amended, so as to read: "A bill to extend for an additional 3 years the authorization of appropriations under the State Technical Services Act of 1965."

MESSAGE FROM THE HOUSE— ENROLLED BILLS SIGNED

A message from the House of Representatives, By Mr. Hackney, one of its reading clerks, announced that the Speaker had affixed his signature to the following enrolled bills, and they were signed by the President pro tempore:

H.R. 2709. An act for the relief of Suh Yoon Sup;

H.R. 4030. An act for the relief of Yong Chin Sager;

H.R. 4370. An act for the relief of Sandy Kyriacoula Georgopoulos and Anthony Georgopoulos;

H.R. 7042. An act for the relief of Dr. Jose Del Rio;

H.R. 7431. An act for the relief of Gilmer County, Ga.;

H.R. 8241. An act for the relief of Victorino Severo Blanco;

H.R. 12639. An act to remove certain limitations on ocean cruises;

H.R. 13439. An act to correct and improve the Canal Zone Code, and for other purposes;

H.R. 15190. An act to amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans;

H.R. 15591. An act for the relief of Pfc. John Patrick Collopy, US51615166;

H.R. 15972. An act to permit black and white or color reproductions of United States and foreign postage stamps under certain circumstances, and for other purposes; and

H.R. 16489. An act making appropriations for the Treasury and Post Office Departments, the Executive Office of the President, and certain independent agencies, for the fiscal year ending June 30, 1969, and for other purposes.

EXTENSION OF AUTHORITY OF EXPORT - IMPORT BANK IN ORDER TO IMPROVE THE BAL- ANCE OF PAYMENTS

Mr. MANSFIELD. Mr. President, I ask unanimous consent that the Senate proceed to the consideration of Calendar No. 1082 S. 3218. I do this so that the bill may be the pending business on Monday next.

The PRESIDING OFFICER. The bill will be stated by title.

The ASSISTANT LEGISLATIVE CLERK. A bill (S. 3218) to enable the Export-Import Bank of the United States to approve extension of certain loans, guarantees, and insurance in connection with exports from the United States in order to improve the balance of payments and foster the long-term commercial interests of the United States.

The PRESIDING OFFICER. Is there objection to the request of the Senator from Montana?

There being no objection, the Senate proceeded to consider the bill.

UNANIMOUS-CONSENT AGREEMENT

Mr. MANSFIELD. Mr. President, I ask unanimous consent that at the conclusion of routine morning business on Monday, June 17, 1968, debate on the pending bill be limited to not to exceed

one-half hour on each amendment, to be divided between the proponent of the amendment and the Senator from Maine [Mr. MUSKIE]; that the time on the bill be limited to not to exceed 2 hours, to be divided and controlled by the Senator from Maine [Mr. MUSKIE] and the minority leader [Mr. DIRKSEN], in accordance with the usual form.

The unanimous-consent agreement reduced to writing is as follows:)

Ordered, That, effective on Monday, June 17, 1968, at the conclusion of routine morning business, during the further consideration of the bill (S. 3218) to enable the Export-Import Bank of the United States to approve extension of certain loans, guarantees, and insurance in connection with exports from the United States in order to improve the balance of payments and foster the long-term commercial interests of the United States, debate on any amendment, motion, or appeal, except a motion to lay on the table, shall be limited to not to exceed one-half hour, to be equally divided and controlled by the mover of any such amendment or motion and the majority leader: *Provided*, That in the event the majority leader is in favor of any such amendment or motion, the time in opposition thereto shall be controlled by the minority leader or some Senator designated by him: *Provided further*, That no amendment that is not germane to the provisions of the said bill shall be received.

Ordered further, That on the question of the final passage of the said bill debate shall be limited to not to exceed two hours, to be equally divided and controlled, respectively, by the Senator from Maine [Mr. MUSKIE] and the minority leader: *Provided*, That the said leaders, or either of them, may, from the time under their control on the passage of the said bill, allot additional time to any Senator during the consideration of any amendment, motion, or appeal.

GUN CONTROL LEGISLATION

Mr. MAGNUSON. Mr. President, in a recent article in the New Yorker magazine tracing the history of gun control legislation in Congress, a Senate advocate of strong gun control legislation was quoted as saying, "As things now stand, I can't see how any Western Senator could possibly support the bill."

And, said the author, "None of them has."

Yesterday, Mr. President, I became a cosponsor of the administration's gun control bill, introduced by the senior Senator from Connecticut [Mr. Dodd]. That bill would extend to rifles, shotguns, and ammunition the restrictions which we recently approved on the sale of handguns. It would eliminate direct mail order sales and sales to non-residents and juveniles under 18.

In addition, I am prepared to support effective measures to require the registration and licensing of all firearms, by State and local action if possible, by Federal action if necessary.

Last night, I had a call from a good friend, the editor of a Washington State sportsman's publication—a publication which has long fought against gun control legislation. "You have turned your back on us," he said, "You have changed." "Yes," I said, "I have changed some of my views." "Well, then," he said, "we are going to have to oppose your reelection in November."

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I said I was sorry about that. We had seen eye to eye on so many issues over the years. We had fought together many good fights for the conservation of our fish and wildlife resources, to preserve Washington as one of the few remaining natural paradises for hunters and fishermen. But, of course, it was his privilege to endorse or to condemn any candidate he chose.

He asked me what had brought me to this decision. And, although he was deeply disturbed, he had the courtesy to hear me out. And today, I would like to tell you, as I told him, why I have made this decision.

I know of no one whose conscience has not been deeply troubled by the violence and terror surging through the streets of every city and every State. Not just last week, not just last month—but a steadily evolving pattern of disorder has made it seem as if the voice of sanity and of civil order in our country have been drowned out by the sound of gunfire in the streets.

I am not talking primarily about the terrible decimation of some of our finest leaders. I am talking about the brutal, sudden death that each day, each hour greets ordinary citizens and their families—a high school student standing on a street corner; two young marines stopping for a cup of coffee after an evening with their girl friends; a young wife hurrying home having stayed out later than she had planned to finish the family shopping.

Yes, I am thinking of President Kennedy and Senator Kennedy, Martin Luther King, Jr., and Medgar Evers. But I am also thinking of the 16 dead and the 31 wounded boys and girls, and passers-by, struck down by a deranged student firing from the tower of the University of Texas—and all of these were felled by rifle or shotgun fire. In 1966, there was a major gun crime committed every 5 minutes.

Of course, no gun law—even a law stringent beyond the bounds of constitutionality—could eradicate assassinations, murder, robbery, assault. But a sound gun control law is one sane and rational measure which can be of great help in restoring the balance which now finds the rate of gun murders in this country 25 times that of Germany, 55 times that of Great Britain, and 90 times the rate for the Netherlands.

There is another balance at stake. For what we are really asked to do by the opponents of gun control legislation is to balance the reasonable fear of wives and children against the convenience of the hunter.

For the talk of a dark plot to confiscate the guns of law-abiding hunters and sportsmen is nonsense. Is J. Edgar Hoover, an outspoken and fervent advocate of strong gun laws, any less a defender of liberty than the most patriotic rifleman in the country?

No, what we are asking owners of firearms to do is no more than they now do uncomplainingly with their automobiles, their children's bicycles, even their dogs. I often go duck hunting with a good friend who has two shotguns and two good hunting dogs. His dogs are licensed

—his guns are not. Is his liberty infringed if he must do for a lethal weapon what he now must do for his dogs?

He will also have to buy his weapons from a licensed dealer in his State—a dealer who will be able to see that he is a grown man, a law-abiding citizen of his community, and not an escaped convict or a deranged teenager.

Of course, there are legitimate and necessary reasons for law-abiding citizens to possess guns. This legislation will protect such citizens, just as the car owner is protected through registration against misappropriation or theft.

This legislation will not disarm anyone with a right to a gun. It will make it just a little bit more difficult for the young or the insane to lay their hands on a lethal weapon upon receiving their first impulse to commit mayhem. It will enable police officials with somewhat greater efficiency to trace murder weapons. It should prevent the petty criminal, if not the organized gangster, who cannot buy a gun over the counter from a licensed dealer, from buying one by mail. And it might stop the adolescent with a sudden urge to feel like a man by having some fun with a gun.

In Dallas, Tex., where guns are freely obtainable by anyone, the percentage of homicides committed by gun in 1963 was 72 percent; while in New York, which we think of as a center of crime, the Sullivan law, one of the strongest local gun laws, has kept the rate of murder by gun at 25 percent. Among the country's 10 largest cities, New York had the fifth lowest assault rate, the third lowest murder rate, and the lowest robbery rate. Perhaps, more important, the New York law makes it possible for police officials to make arrests for the illegal possession of pistols and revolvers before those weapons can be used.

Again, as J. Edgar Hoover has said:

Those who claim that the availability of firearms is not a factor in murders in this country are not facing reality.

Is it not time we gave this basic support to our law enforcement officers?

I have pledged to the Senate that when the gun legislation is referred to the Commerce Committee, I will do all within my power to see that legislation is reported out without delay. And I will also do all that I can to see that that legislation while reasonable and practical is fully adequate to the need.

I know what tomorrow's mail will bring. I am ready for the angry and intemperate letters, many of them from old friends and colleagues—from many I have hunted with, from men who have long thought of me, as I have, as one of them. But for me, this has become a matter of deep conscience.

The inconvenience will be so insignificant; the contribution to the law and order of our society, so great.

THE PROPOSED ABM SYSTEM

Mr. COOPER. Mr. President, I rise today to bring before the Senate an issue whose costs and consequences for our defense and security and for our foreign policy are of the greatest importance.

I speak of the proposed ABM system. The ostensible purpose of the proposed Sentinel ABM system, as it is now called, would be to construct a defense against a possible Chinese ICBM attack. The total cost for the development, construction and deployment of this so-called thin system is estimated to be from \$5 to \$7 billion, although its final costs would most certainly be much higher. The request for fiscal year 1969 totals \$1,195.6 million. This amount is contained in two bills: S. 3293, the military procurement research and development bill, and H.R. 16703, the military construction bill, and I understand that the AEC bill contains \$324,500,000 for Sentinel warhead research.

I ask unanimous consent that a table showing the amounts contained in these bills for the ABM system be printed in the Record at the conclusion of my remarks.

The PRESIDING OFFICER. Without objection, it is so ordered.

(See exhibit 1.)

Mr. COOPER. Mr. President, I have been informed today that the Committee on Appropriations has approved and will report to the Senate a bill in which funds will be recommended for appropriation to commence the deployment of the Sentinel ABM system, for site acquisition and construction, in the amount of \$227,300,000.

The controversy pro and con about the merits of this system has raged for several years. Several committees in the Senate have studied the issue thoroughly. The Armed Services Committee, the Joint Atomic Energy Committee, and the Foreign Relations Committee, subcommittee under the able leadership of the Senator from Tennessee [Mr. GORE], have conducted detailed hearings, both public and executive. The hearings before these committees have produced a very useful record. In addition, Congress, has had the benefit of the testimony of former Secretary of Defense McNamara on several occasions, and there has been much discussion in newspapers, magazines, and scientific journals, particularly during the past 6 months.

I ask unanimous consent to have printed at the conclusion of my remarks one of the useful and informative articles that has been recently published in the March issue of *Scientific American*; the testimony of former Secretary of Defense McNamara before the Committee on Armed Services, in the early part of this year; and an annotated bibliography of the most important works discussing the ABM system, which has been prepared by the Library of Congress.

The PRESIDING OFFICER. Without objection, it is so ordered.

(See exhibit 2.)

Mr. COOPER. But there is still a necessity to have a full public debate of the ABM issue on the floor of the Senate. I recall that several years ago, when appropriations were recommended—I believe it was for the Nike X system—the Senator from South Carolina invoked the rule to close the door, and there was a very full and informative debate on that issue.

In April, when the military procurement appropriation bill was before the Senate, a bill which included for certain phases of the ABM system, a unanimous-consent agreement was obtained which limited debate on an amendment to 1 hour. As a result, the debate on this most important venture the ABM was limited to 1 hour for each amendment.

This limitation prevented the full discussion of the issues that was required and many desired. But I believe the ABM issue is of such importance—its purposes and its consequences—that we should have a full debate in the Senate upon it. We should first consider the feasibility, necessity, and the consequences of constructing an ABM system, before approving appropriations which would lead step by step to its installation.

Mr. President, my interest in this subject was stimulated several years ago when we had the important debate on the Nike X behind closed doors, and later by hearings that were held in the Committee on Foreign Relations by the able Senator from Tennessee [Mr. Gore]. Since that time, I have read the testimonies and the statements by former Secretary of Defense McNamara and other administration officials, and I have read, as much as possible, on the subject. I do not claim to be a technical expert, and such judgments as I have made have been based upon my own reading and the results of discussion with others concerned with the issue.

The ABM issue is not a new one. Two previous ABM systems, the Nike-Zeus and Nike X, planned by the United States, were never deployed because it was judged by the administration and Congress at the time—and history has proven that these judgments were correct—that if such systems were built, they would have been obsolete before completion and therefore obviously not worth the cost. In 1959, President Eisenhower, for example, stopped the Nike-Zeus deployment on grounds very similar to those that now apply to the Sentinel system. Although these systems were not built, technological development and research for ABM systems have continued and the state of the art has progressed.

I shall not go into great detail this afternoon to describe the Sentinel system, but I should like to place in the Record a very helpful description of the system which was provided by Dr. John S. Foster, Jr., Director of Defense Research and Engineering, which he testified last year before the Committee on Foreign Relations, on Monday, February 6, 1967.

I ask unanimous consent that his statement be printed in the Record at the conclusion of my remarks.

The PRESIDING OFFICER. Without objection, it is so ordered.

(See exhibit 3.)

Mr. COOPER. I know that Dr. Foster has made other more detailed statements, and he has testified several times and at length before the Committee on Armed Services and the Committee on Appropriations. This is a simple statement explaining the system. I shall read just a few paragraphs:

The next important development in defense effectiveness came with the introduction of "area defense" in the period 1964-65. I would like to define the term "area defense."

The detection sensor is the perimeter acquisition radar (PAR) which detects ballistic missiles at long ranges. The PAR radar tracks the incoming missile and predicts its future path. To intercept the incoming missile, we employ the Spartan missile which is a long-range interceptor developed from the old Nike-Zeus. Once the PAR radar has predicted the future path of the missile a Spartan missile is fired so as to intercept it. This interceptor intercepts the incoming missile well above the atmosphere. Because of its long range the Spartan can intercept incoming missiles directed at targets several hundred miles from the Spartan battery location. The Spartan missile is guided by a missile site radar (MSR) which is associated with each battery.

With the introduction of Spartan, the Zeus interceptor was no longer required—in effect, the Spartan replaced the Zeus.

Comparatively few Spartan batteries can defend the whole United States from simple attacks.

You will note I said "simple attacks." It is still possible for a sophisticated opponent to confuse the defense and make the firepower demands on Spartan too high. In this case, terminal defense Sprints must be relied upon if we are to furnish a defense. The Spartan thus functions in two ways. It can provide a very effective defense over extended areas against simple threats. Against not so simple threats, it provides a defense in depth and is complementary to Sprint. In any case it forces the enemy, if he wishes to penetrate, to pay the price demanded by a sophisticated penetration aids program.

You will note that I have described a flexible set of building blocks consisting of PAR and MSR radars and two types of interceptor missiles, Spartan and Sprint. We also have a very large, sophisticated radar called TACMAR, designed specifically against sophisticated attacks. They can be put together in various ways to provide varying levels of defense against different threats.

For example, if we wished to defend the United States against a large Soviet attack, we would provide an overlay of an area defense such as I have described. As I mentioned earlier, however, it would be necessary to depend primarily on terminal Sprint defense, including TACMARs, at selected cities. A selected city defense (including the area component) would cost about \$10 or \$20 billion depending on the number of cities defended.

As a matter of technical judgment, I believe that these larger deployments carry with them technical risks. The likelihood of large and sophisticated attacks with the deployment of significant U.S. defenses increases the technical uncertainty of the defensive system. Even with an ABM deployment we would have to expect that in an all-out exchange, dozens of their warheads would likely explode in our cities.

Mr. President, although untested and unproven as a complete system—and I know that the various components: the two radars PAR, and MSR, and the two missiles Spartan and Sprint have not been tested as a coordinated fully developed system and cannot be fully tested because of the Nuclear Test Ban Treaty—and even though some components have yet to be translated from theory to practical operation, the immediate production of its elements and the deployment of the Sentinel ABM system have been urged by its proponents as necessary because, in theory, it would

provide a defense against a possible Chinese attack. It is argued that we should be prepared to spend whatever money is required to gain the additional measure of security that might be supplied by such a defense.

If it can be demonstrated that this defense system is necessary for the security of the United States, I would be certain that every one of us would be willing to vote for any sum of money that would provide that security. However, I would hope that this matter would be fully and fairly debated before we go further with the provision of funds for the deployment of a Sentinel system. I contend that we have not reached the point where we have the available information which would prove with any reasonable assurance that such a system is necessary or that it would provide any additional security to our country than is available now through nuclear deterrence.

The assertion that the Sentinel ABM system would strengthen our defenses is not at all certain. Nor do the facts make it clear that there is a need to deploy the Sentinel system now or that deployment now or in the future would enhance our security in the period between 1972-75 as is claimed.

First, let us examine the "threat" against which the Sentinel ABM system is designed—the threat of Communist China.

The Chinese have not yet successfully fired or deployed an ICBM. It is believed that they have exploded about seven nuclear devices. It is known they are engaged in surface-to-surface firing. However, there is no evidence they have been able to fire or deploy an intercontinental ballistic missile.

A year ago it was thought that an ICBM would be fired in late 1967 or 1968, and would be in production by 1971 or 1972. The cultural revolution has caused such turmoil within China that it is apparent that the original estimate of successful firing and production had to be extended. It is still estimated that Communist China has the capability of producing a number of ICBM's by the mid-1970's.

If the present plans of the administration—the immediate deployment of the Sentinel ABM system—should proceed according to schedule, supported by the appropriations recommended and to be provided by the bills I have noted, it is estimated that the ABM system could be installed in our country by 1974.

Comparing the capabilities of China to successfully fire and develop an effective ICBM system with the capability of the United States to install a thin system if it should be determined necessary, I can see no reason for the Congress to approve this year the deployment of an ABM system and start on the road to larger systems, with all the unfortunate consequences such action can entail.

I know that in the testimony of former Secretary McNamara before the Committee on Armed Services this year—which I referred to earlier—he did say that our intelligence would indicate that the Chinese had this capability. However,

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at other points in his testimony, he concluded that the missiles would be primitive and inaccurate, and by 1975 they would not be able to produce a large number of these missiles.

We must ask as reasonable persons if it is likely that Communist China would assure its own destruction by a nuclear attack on the United States—armed with a vast array of nuclear weapons.

Some advocates assert that the Soviets are building an ABM system and that we must begin the construction of an ABM system to match or surpass their efforts. Is the reason compelling some to urge the deployment of the Sentinel ABM system that it could be a "building block" leading toward the development of an extensive and heavier ABM system to defend the United States against an attack by the Soviet Union?

Will it be argued that the deployment of a "thin" ABM system against attack from China would itself provide some measure of protection against a possible Soviet nuclear attack and even greater assurance of American nuclear superiority in the event of a Soviet attack? These arguments can be challenged.

Both the United States and the Soviet Union have the nuclear capability many times over to destroy each other and we have been assured again and again by our Secretary of Defense and our military authorities that the United States has the capability to destroy the Soviet Union even after a first strike by the Soviet Union.

Former Secretary McNamara has termed this the "assured destruction capability of the United States," and that assuming a first strike on the United States, that our own weapons systems have that element of "survivability," which is the term he has used to express the view that we would have the nuclear systems inviolate required to strike back and destroy the Soviet Union.

This testimony, which I shall place in the Record, provides the number of missiles which the United States possesses and the estimate of the Soviet missile strength. There are additional tables that show the consequences of a first strike by the Soviet Union upon the United States, and of our response upon the Soviet Union. These tables include an estimate of the damage that would be inflicted, the loss of life, and productive capacity. These tables, and the testimony of Secretary McNamara, argue that either the attainment of nuclear parity by the Soviet Union, which I believe to be unlikely, or the installation of ABM systems here in the United States directed at the Soviet Union, would not alter the capability of either country to destroy each other. That capability, of course, is the deterrent. We have believed, thus far, that if there were any intention on the part of either to strike at each other, the deterrent or what has been called the balance of terror, has prevented any possible intentions from being carried out.

As I shall note later, the installation of the ABM systems could upset this deterrent. Instead of achieving greater security for the United States, it could lead to greater danger. If the Soviets

achieve parity with the United States, which is unlikely, the assured ability to destroy each other remains. An ABM defense system—"thin" or "heavy"—designed for protection against the Soviet Union would not alter this ability to completely destroy each other. It would, in fact, only accelerate the arms race. More offensive missiles or more defensive missiles would lead only to a multiplication of the destruction capabilities of the United States and the Soviet Union. There does not seem to be any good reason to add more destructive power to the existing ability to destroy each other and, for all practical purposes, all civilized life.

We know that the Soviets have built a primitive ABM system near Leningrad. Intelligence indicates that the Tallin system is an antiaircraft system for use against high-flying bombers and reconnaissance aircraft. According to recent intelligence estimates—this, again, is a statement by Secretary McNamara—construction of the so-called galosh system surrounding Moscow which was begun in 1960 has not been completed and is not being pursued according to schedule. It has not been extended to other cities in the Soviet Union. Of course, we do not know whether the Soviets are reconsidering its usefulness or considering more fruitful negotiations with the United States to limit the deployment of ABM systems.

In my view, the balance sheet comes down to the following:

First. There is no present threat to American security from a Chinese ICBM attack. According to the consensus of the intelligence community, the Chinese will not have a capability to launch an ICBM attack until the mid-1970's, and reckless as some consider the Communist Chinese to be, it is difficult to believe that they would invite the certain destruction of their country by a nuclear attack upon the United States.

Second. The destructive capabilities of the United States and the Soviet Union will not be altered by a thin or heavy ABM system.

Third. Our surveillance and intelligence capabilities are of such magnitude and quality that the United States has the capability of providing information of new situations in China or the Soviet Union which would require greater effort to develop and deploy additional offensive or defensive weapons.

Fourth. When the proposed Sentinel ABM system's technical characteristics are examined, one must conclude that the planned system would not provide the assurance of protection to justify its cost. The history of progress in missile technology is that offensive technology will always outdistance defensive efforts. Had Nike-Zeus been deployed, for example, it would have been obsolete before completion. The Sentinel system now planned for deployment may become quickly obsolete. It is not designed to defend against MIRV—missile with multiple warheads and independently targeted—which the United States, and we can assume the Soviets, are developing, or whether they are reconsidering its usefulness.

Again, as pointed in the testimony of both Dr. Foster and Secretary McNamara, the value and effectiveness of the ABM system is diminished as the number of objects coming in is increased. Assuming that the Soviet Union or, some time in the future, the Communist Chinese could develop a MIRV system with a number of missiles which can be released and independently find their targets, this thin system would have little value.

Fifth. The Sentinel cannot be fully tested as a complete system. That is not to say, however, that research and development, including the building of prototypes, will not go forward, for the amendments I will propose would not strike from the bills funds for continued research and development. The advancement of the state of the art will not be restricted. It would be perfected, and available, if the Congress should determine on better evidence than is now available that an ABM system is feasible and necessary for the security of the United States.

It has been effectively argued on the Senate floor that some of the elements have not yet been thoroughly tested or in some cases even built. The technical reliability of all its components is not yet known. Certainly, extension of research for another year would give an opportunity for perfection of the art.

Finally, I come to another matter which I think is very important:

Sixth. Since the Glassboro Conference in May 1967 when the President and Secretary McNamara informed Premier Kosygin that the U.S. Government desired to work with the Soviet Union to limit mutually the development of strategic nuclear weapons, including ABM systems, efforts to work out an agreement with the Soviets have continued. The Vietnam war—and other factors—have stood in the way of a favorable conclusion, but our effort to halt the nuclear arms race should continue as long as there is any possibility of bringing about a limitation. I believe that a decision by the Congress to begin the deployment of the thin system would only make agreement more difficult.

I should like to quote from President Johnson's address to the United Nations General Assembly yesterday, on the occasion of the nuclear proliferation pact ceremony.

He said in part:

We desire—yes, we urgently desire—to begin early discussion on the limitation of strategic offensive and defensive weapons systems.

We shall search for an agreement that will not only avoid another costly and futile escalation of the arms race, but will de-escalate it.

I believe that this treaty can lead to further measures that will inhibit the senseless continuation of the arms race. I believe that it can give the world time—very precious time—to protect itself against Armageddon.

It has been noted by Secretary McNamara, and our intelligence, that the Soviet Union is not proceeding with dispatch to complete installation of an ABM system around Moscow, and that it has not extended it to any other city. If we now begin to deploy an antiballistic mis-

EXHIBIT 1

MISSILE DEFENSE FUNDING LEGISLATION—FISCAL YEAR 1969 DEFENSE APPROPRIATIONS

(In millions of dollars)

Activity	Military procurement authorization bill ¹	Military construction authorization bill ²	Military construction appropriation bill	Defense appropriation bill
Procurement:				
Production base support.....				
Ground support equipment.....				
Spartan components.....				
Total.....	342.7			342.7
Construction: Site acquisition and construction.....		227.3	227.3	
Operations and maintenance.....				39.0
Military personnel.....				5.7
Total, Sentinel deployment.....	342.7	227.3	227.3	387.4
Sentinel R. & D.....	312.9			312.9
Total, Sentinel.....	655.6			700.3
Other ABM R. & D.:				
Nike-X.....				
Defender.....	268.0			268.0
Total ABM program.....	923.6	227.3	227.3	968.3

¹ S. 3295, passed Apr. 19.
² H.R. 16703.

MISSILE DEFENSE FUNDING REQUESTS—FISCAL YEAR 1969
DEFENSE APPROPRIATIONS

(In millions of dollars)

Procurement:	
Production base support.....	137.2
Ground support equipment.....	199.2
Spartan components.....	6.3
Total.....	342.7
Construction: Site acquisition and construction.....	227.3
Operations and maintenance.....	39.0
Military personnel.....	5.7
Total, Sentinel deployment.....	614.7
Sentinel R. & D.....	312.9
Total, Sentinel.....	927.6
Other ABM R. & D.:	
Nike-X.....	165.0
Defender.....	103.0
Total.....	268.0
Total, ABM request ²	1,195.6

¹ Does not include \$36,000,000 to be carried over from fiscal year 1968 appropriation for construction planning.
² In addition, AEC appropriation will reportedly include \$324,500,000 for Sentinel.

EXHIBIT 2

[From the Scientific American, March 1968]

ANTI-BALLISTIC-MISSILE SYSTEMS

(By Richard L. Garwin and Hans A. Bethe)

(NOTE.—The U.S. is now building a "light" ABM system. The authors argue that offensive tactics and cheap penetration aids could nullify the effectiveness of this system and any other visualized so far.)

Last September, Secretary of Defense McNamara announced that the U.S. would build "a relatively light and reliable Chinese-oriented ABM system." With this statement he apparently ended a long and complex debate on the merits of any kind of anti-ballistic-missile system in an age of intercontinental ballistic missiles carrying multimegaton thermonuclear warheads. Secretary McNamara added that the U.S. would "begin actual production of such a system at the end of this year," meaning the end of 1967.

As two physicists who have been concerned for many years with the development and deployment of modern nuclear weapons we wish to offer some comments on this important matter. On examining the capabilities of ABM systems of various types, and on considering the stratagems available to a determined enemy who sought to nullify the effectiveness of such a system, we have come to the conclusion that the "light" system described by Secretary McNamara will add little, if anything, to the influences that should restrain China indefinitely from an attack on the U.S. First among these factors is

China's certain knowledge that, in McNamara's words, "we have the power not only to destroy completely her entire nuclear offensive forces but to devastate her society as well."

An even more pertinent argument against the proposed ABM system, in our view, is that it will nourish the illusion that an effective defense against ballistic missiles is possible and will lead almost inevitably to demands that the light system, the estimated cost of which exceeds \$5 billion, be expanded into a heavy system that could cost upward of \$40 billion. The folly of undertaking to build such a system was vigorously stated by Secretary McNamara. "It is important to understand," he said, "that none of the [ABM] systems at the present or foreseeable state of the art would provide an impenetrable shield over the United States. . . . Let me make it very clear that the [cost] in itself is not the problem: the penetrability of the proposed shield is the problem."

In our view the penetrability of the light, Chinese-oriented shield is also a problem. It does not seem credible to us that, even if the Chinese succumbed to the "insane and suicidal" impulse to launch a nuclear attack on the U.S. within the next decade, they would also be foolish enough to have built complex and expensive missiles and nuclear warheads peculiarly vulnerable to the light ABM system now presumably under construction (a system whose characteristics and capabilities have been well publicized). In the area of strategic weapons a common understanding of the major elements and technical possibilities is essential to an informed and reasoned choice by the people, through their government, of a proper course of action. In this article we shall outline in general terms, using nonsecret information, the techniques an enemy could employ at no great cost to reduce the effectiveness of an ABM system even more elaborate than the one the Chinese will face. First, however, let us describe that system.

Known as the Sentinel System, it will provide for long-range interception by Spartan antimissile missiles and short-range interception by Sprint antimissile missiles. Both types of missile will be armed with thermonuclear warheads for the purpose of destroying or inactivating the attacker's thermonuclear weapons, which will be borne through the atmosphere and to their targets by reentry vehicles (RV's). The Spartan missiles, whose range is a few hundred kilometers, will be fired when an attacker's reentry vehicles are first detected rising above the horizon by perimeter acquisition radar (PAR).

sile system, in the light of past behavior. then, the Soviet Union will respond, and we will respond to their response, and we will have entered again a new phase of the nuclear arms race.

In the light of these conclusions, it is my intention to introduce amendments to the military procurement appropriations bill, and H.R. 16703, the military construction bill, to strike from these bills funds to be used for the deployment of the ABM system. My amendment would not, and I repeat, would not, strike funds for continuing research and development upon such systems.

The United States cannot afford at this time to spend money on a system costing \$5 to \$7 billion, which may be extended to a heavier system costing \$40 billion or more, unless it is essential to our security. We have found it necessary to commit ourselves to an expenditure reduction of \$6 billion. We believe it necessary to raise the taxes of our people and we have found it necessary to cut needed and essential domestic programs. In view of our difficulties, and in view of our priorities, I do not believe the deployment of the Sentinel can be justified at the present time.

There are other questions concerning the proposed Sentinel ABM system that should be addressed by the Congress and the people of this country. We must ask the question. If we build the ABM, what response will this bring from the Soviet Union—the only great nuclear power other than the United States? In the light of past experience, there will be a radical response—an escalation of the nuclear arms race—offensive and defensive. We must ask, How much of our national energy will be devoted to meeting the actions and counteractions produced by our decisions to go ahead with such a system? Will such a system contribute to strengthening the security of our country, or will it increase the danger of a nuclear catastrophe?

I do not believe that the deployment of an ABM system at this time is in our country's best interests. I do not believe it offers any advantage to the United States, military, political or moral. My discussion today is not detailed. I have wanted to present some issues for the Senate's consideration, discussion, and debate, and, hopefully, to raise questions which can be discussed later and should be discussed thoroughly when the first bill on that subject comes before the Senate, providing for funds to be used in the deployment of that system. It is my intention to further elaborate these issues and others when the bills are before the Senate for action.

We have hopefully learned a hard lesson from Vietnam. We did not rigorously consider the implications of our increasing involvement in Vietnam when it might have been possible to extricate ourselves with relatively small loss and at a time and in such a way that might have furthered the opportunity for self-determination and peace in South Vietnam. We dare not fail to look at the implications of the deployment of the ABM and to ask, if taken, whether it would lead to more dangerous involvements and consequences.

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If the attacker is using his available propulsion to deliver maximum payload, his reentry vehicles will follow a normal minimum-energy trajectory, and they will first be sighted by one of the PAR's when they are about 4,000 kilometers, or about 10 minutes, away. If the attacker chooses to launch his rockets with less than maximum payload, he can put them either in a lofted trajectory or in a depressed one. The lofted trajectory has certain advantages against a terminal defense system. The most extreme example of a depressed trajectory is the path followed by a low-orbit satellite. On such a trajectory a reentry vehicle could remain below an altitude of 160 kilometers and would not be visible to the horizon-search radar until it was some 1,400 kilometers, or about three minutes, away. This is FOBS: the fractional-orbit bombardment system, which allows intercontinental ballistic missiles to deliver perhaps 50 to 75 percent of their normal payload.

In the Sentinel system Spartans will be launched when PAR has sighted an incoming missile; they will be capable of intercepting the missile at a distance of several hundred kilometers. To provide a light shield for the entire U.S. about half a dozen PAR units will be deployed along the northern border of the country to detect missiles approaching from the general direction of the North Pole. Each PAR will be linked to several "farms" of long-range Spartan missiles, which can be hundreds of kilometers away. Next to each Spartan farm will be a farm of Sprint missiles together with missile site radar (MSR), whose function is to help guide both the Spartans and the shorter-range Sprints to their targets. The task of the Sprints is to provide terminal protection for the important Spartans and MSR's. The PAR's will also be protected by Sprints and thus will require MSR's nearby.

Whereas the Spartans are expected to intercept an enemy missile well above the upper atmosphere, the Sprints are designed to be effective within the atmosphere, at altitudes below 35 kilometers. The explosion of an ABM missile's thermonuclear warhead will produce a huge flux of X-rays, neutrons and other particles, and within the atmosphere a powerful blast wave as well. We shall describe later how X-rays, particles and blast can incapacitate a reentry vehicle.

Before we consider in detail the capabilities and limitations of ABM systems, one of us (Garwin) will briefly summarize the present strategic position of the U.S. The primary fact is that the U.S. and the U.S.S.R. can annihilate each other as viable civilizations within a day and perhaps within an hour. Each can at will inflict on the other more than 120 million immediate deaths, to which must be added deaths that will be caused by fire, fallout, disease and starvation. In addition more than 75 percent of the productive capacity of each country would be destroyed, regardless of who strikes first. At present, therefore, each of the two countries has an assured destruction capability with respect to the other. It is usually assumed that a nation faced with the assured destruction of 30 percent of its population and productive capacity will be deterred from destroying another nation, no matter how serious the grievance. Assured destruction is therefore not a very flexible political or military tool. It serves only to preserve a nation from complete destruction. More conventional military forces are needed to fill the more conventional military role.

Assured destruction was not possible until the advent of thermonuclear weapons in the middle 1950's. At first, when one had to depend on aircraft to deliver such weapons, destruction was not really assured because a strategic air force is subject to surprise attack, to problems of command and control and to attrition by the air defenses

of the other side. All of this was changed by the development of the intercontinental ballistic missile and also, although to a lesser extent, by modifications of our B-52 force that would enable it to penetrate enemy defenses at low altitude. There is no doubt today that the U.S.S.R. and the U.S. have achieved mutual assured destruction.

The U.S. has 1,000 Minuteman missiles in hardened "silos" and 54 much larger Titan II missiles. In addition we have 656 Polaris missiles in 41 submarines and nearly 700 long-range bombers. The Minutemen alone could survive a surprise attack and achieve assured destruction of the attacker. In his recent annual report the Secretary of Defense estimated that as of October, 1967, the U.S.S.R. had some 720 intercontinental ballistic missiles, about 30 submarine-launched ballistic missiles (excluding many that are airborne rather than ballistic) and about 155 long-range bombers. This force provides assured destruction of the U.S.

Secretary McNamara has also stated that U.S. forces can deliver more than 2,000 thermonuclear weapons with an average yield of one megaton, and that fewer than 400 such weapons would be needed for assured destruction of a third of the U.S.S.R.'s population and three-fourths of its industry. The U.S.S.R. would need somewhat fewer weapons to achieve the same results against the U.S.

It is worth remembering that intercontinental missiles and nuclear weapons are not the only means of mass destruction. They are, however, among the most reliable, as they were even when they were first made in the 1940's and 1950's. One might build a strategic force somewhat differently today, but the U.S. and the U.S.S.R. have no incentive for doing so. In fact, the chief virtue of assured destruction may be that it removes the need to race—there is no reward for getting ahead. One really should not worry too much about new means for delivering nuclear weapons (such as bombs in orbit or fractional-orbit systems) or about advances in chemical or biological warfare. A single thermonuclear assured-destruction force can deter such novel kinds of attack as well.

Now, as Secretary McNamara stated in his September speech, our defense experts reckoned conservatively six to 10 years ago, when our present strategic-force levels were planned. The result is that we have right now many more missiles than we need for assured destruction of the U.S.S.R. If war comes, therefore, the U.S. will use the excess force in a "damage-limiting" role, which means firing the excess at those elements of the Russian strategic force that would do the most damage to the U.S. Inasmuch as the U.S.S.R. has achieved the level of assured destruction, this action will not preserve the U.S., but it should reduce the damage, perhaps sparing a small city here or there or reducing somewhat the forces the U.S.S.R. can use against our allies. To the extent that this damage-limiting use of our forces reduces the damage done to the U.S.S.R. it may slightly reduce the deterrent effect resulting from assured destruction. It must be clear that only surplus forces will be used in this way. It should be said, however, that the exact level of casualties and industrial damage required to destroy a nation as a viable society has been the subject of surprisingly little research or even argument.

One can conceive of three threats to the present rather comforting situation of mutual assured destruction. The first would be an effective counterforce system: a system that would enable the U.S. (or the U.S.S.R.) to incapacitate the other side's strategic forces before they could be used. The second would be an effective ballistic-missile defense combined with an effective anti-aircraft system. The third would be a transition from a bipolar world, in which the U.S. and the U.S.S.R. alone possess overwhelming power,

to a multipolar world including, for instance, China. Such threats are of course more worrisome in combination than individually.

American and Russian defense planners are constantly evaluating less-than-perfect intelligence to see if any or all of these threats are developing. For purposes of discussion let us ask what responses a White side might make to various moves made by a Black side. Assume that Black has threatened to negate White's capability of assured destruction by doing one of the following things: (1) it has procured more intercontinental missiles, (2) it has installed some missile defense or (3) it has built up a large operational force of missiles each of which can attack several targets, using "multiple independently targetable reentry vehicles" (MIRV's).

White's goal is to maintain assured destruction. He is now worried that Black may be able to reduce to a dangerous level the number of White warheads that will reach their target. White's simplest response to all three threats—but not necessarily the most effective or the cheapest—is to provide himself with more launch vehicles. In addition, in order to meet the first and third threats White will try to make his launchers more difficult to destroy by one or more of the following means: by making them mobile (for example by placing them in submarines or on railroad cars), by further hardening their permanent sites or by defending them with an ABM system.

Another possibility that is less often discussed would be for White to arrange to fire the bulk of his warheads on "evaluation of threat." In other words, White could fire his land-based ballistic missiles when some fraction of them had already been destroyed by enemy warheads, or when an overwhelming attack is about to destroy them. To implement such a capability responsibly requires excellent communications, and the decision to fire would have to be made within minutes, leading to the execution of a prearranged firing plan. As a complete alternative to hardening and mobility, this fire-now-or-never capability would lead to tension and even, in the event of an accident, to catastrophe. Still, as a supplemental capability to ease fears of effective counterforce action, it may have some merit.

White's response to the second threat—an increase in Black's ABM defenses—might be limited to deploying more launchers, with the simple goal of saturating and exhausting Black's defenses. But White would also want to consider the cost and effectiveness of the following: penetration aids, concentrating on undefended or lightly defended targets, maneuvering reentry vehicles or multiple reentry vehicles. The last refers to several reentry vehicles carried by the same missile; the defense would have to destroy all of them to avoid damage. Finally, White could reopen the question of whether he should seek assured destruction solely by means of missiles. For example, he might reexamine the effectiveness of low-altitude bombers or he might turn his attention to chemical or biological weapons. It does not much matter how assured destruction is achieved. The important thing, as Secretary McNamara has emphasized, is that the other side find it credible. ("The point is that a potential aggressor must himself believe that our assured destruction capability is in fact actual, and that our will to use it in retaliation to an attack is in fact unwavering.")

It is clear that White has many options, and that he will choose those that are most reliable or those that are cheapest for a given level of assured destruction. Although relative costs do depend on the level of destruction required, the important technical conclusion is that for conventional levels of assured destruction it is considerably cheaper

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for White to provide more offensive capability than it is for Black to defend his people and industry against a concerted strike.

As an aside, it might be mentioned that scientists newly engaged in the evaluation of military systems often have trouble grasping that large systems of the type created by or for the military are divided quite rigidly into several chronological stages, namely, in reverse order: operation, deployment, development and research. An operational system is not threatened by a system that is still in development; the threat is not real until the new system is in fact deployed, shaken down and fully operative. This is particularly true for an ABM system, which is obliged to operate against large numbers of relatively independent intercontinental ballistic missiles. It is equally true, however, for counterforce reentry vehicles, which can be ignored unless they are built by the hundreds or thousands. The same goes for MIRV's, a development of the multiple reentry vehicle in which each reentry vehicle is independently directed to a separate target. One must distinguish clearly between the possibility of development and the development itself, and similarly between development and actual operation. One must refrain from attributing to a specific defense system, such as Sentinel, those capabilities that might be obtained by further development of a different system.

It follows that the Sentinel light ABM system, to be built now and to be operational in the early 1970's against a possible Chinese intercontinental ballistic missile threat, will have to reckon with a missile force unlike either the Russian or the American force, both of which were, after all, built when there was no ballistic-missile defense. The Chinese will probably build even their first operational intercontinental ballistic missiles so that they will have a chance to penetrate. Moreover, we believe it is well within China's capabilities to do a good job at this without intensive testing or tremendous sacrifice in payload.

Temporarily leaving aside penetration aids, there are two pure strategies for attack against a ballistic-missile defense. The first is an all-warhead attack in which one uses large booster rockets to transport many small (that is, fractional-megaton) warheads. These warheads are separated at some instant between the time the missile leaves the atmosphere and the time of reentry. The warheads from one missile can all be directed against the same large target (such as a city); these multiple reentry vehicles (MRV's) are purely a penetration aid. Alternatively each of the reentry vehicles can be given an independent boost to a different target, thus making them into MIRV's. MIRV is not a penetration aid but is rather a counterforce weapon; if each of the reentry vehicles has very high accuracy, then it is conceivable that each of them may destroy an enemy missile silo. The Titan II liquid-fuel rocket, designed more than 10 years ago, could carry 20 or more thermonuclear weapons. If these were employed simply as MRV's, the 54 Titans could provide more than 1,000 reentry vehicles for the defense to deal with.

Since the Spartan interceptors will each cost \$1 million to \$2 million, including their thermonuclear warheads, it is reasonable to believe thermonuclear warheads can be delivered for less than it will cost the defender to intercept them. The attacker can make a further relative saving by concentrating his strike so that most of the interceptors, all bought and paid for, have nothing to shoot at. This is a high-reliability penetration strategy open to any country that can afford to spend a reasonable fraction of the amount its opponent can spend for defense.

The second pure strategy for attack against an ABM defense is to precede the actual attack with an all-decoy attack or to mix real warheads with decoys. This can be achieved rather cheaply by firing large rockets from

unhardened sites to send light, unguided decoys more or less in the direction of plausible city targets. If the ABM defense is an area defense like the Sentinel system, it must fire against these threatening objects at very long range before they reenter the atmosphere, where because of their lightness they would behave differently from real warheads. Several hundred to several thousand such decoys launched by a few large vehicles could readily exhaust a Sentinel-like system. The attack with real warheads would then follow.

The key point is that since the putative Chinese intercontinental-ballistic-missile force is still in the early research and development stage, it can and will be designed to deal with the Sentinel system, whose interceptors and sensors are nearing production and are rather well publicized. It is much easier to design a missile force to counter a defense that is already being deployed than to design one for any of the possible defense systems that might or might not be deployed sometime in the future.

One of us (Bethe) will now describe (1) the physical mechanisms by which an ABM missile can destroy or damage an incoming warhead and (2) some of the penetration aids available to an attacker who is determined to have his warheads reach their targets.

Much study has been given to the possibility of using conventional explosives rather than a thermonuclear explosive in the warhead of a defensive missile. The answer is that the "kill" radius of a conventional explosive is much too small to be practical in a likely tactical engagement. We shall consider here only the more important effects of the defensive thermonuclear weapon: the emission of neutrons, the emission of X rays and, when the weapon is exploded in the atmosphere, blast.

Neutrons have the ability to penetrate matter of any kind. Those released by defensive weapons could penetrate the heat shield and outer jacket of an offensive warhead and enter the fissile material itself, causing the atoms to fission and generating large amounts of heat. If sufficient heat is generated, the fissile material will melt and lose its carefully designed shape. Thereafter it can no longer be detonated.

The kill radius for neutrons depends on the design of the offensive weapon and the yield, or energy release, of the defensive weapon. The miss distance, or distance of closest approach between the defensive and the offensive missiles, can be made small enough to achieve a kill by the neutron mechanism. This is particularly true if the defensive missile and radar have high performance and the interception is made no more than a few tens of kilometers from the ABM launch site. The neutron-kill mechanism is therefore practical for the short-range defense of a city or other important target. It is highly desirable that the yield of the defensive warhead be kept low to minimize the effects of blast and heat on the city being defended.

The attacker can, of course, attempt to shield the fissile material in the offensive warhead from neutron damage, but the mass of shielding needed is substantial. Witness the massive shield required to keep neutrons from escaping from nuclear reactors. The size of the reentry vehicle will enable the defense to make a rough estimate of the amount of shielding that can be carried and thus to estimate the intensity of neutrons required to melt the warhead's fissile material.

Let us consider next the effect of X rays. These rays carry off most of the energy emitted by nuclear weapons, especially those in the megaton range. If sufficient X-ray energy falls on a reentry vehicle, it will cause the surface layer of the vehicle's heat shield to evaporate. This in itself may not be too damaging, but the vapor leaves the surface

at high velocity in a very brief time and the recoil sets up a powerful shock wave in the heat shield. The shock may destroy the heat shield material or the underlying structure.

X rays are particularly effective above the upper atmosphere, where they can travel to their target without being absorbed by air molecules. The defense can therefore use megaton weapons without endangering the population below; it is protected by the intervening atmosphere. The kill radius can then be many kilometers. This reduces the accuracy required of the defensive missile and allows successful interception at ranges of hundreds of kilometers from the ABM launch site. Thus X rays make possible an area defense and provide the key to the Sentinel system.

On the other hand, the reentry vehicle can be hardened against X-ray damage to a considerable extent. And in general the defender will not know if the vehicle has been damaged until it reenters the atmosphere. If it has been severely damaged, it may break up or burn up. If this does not happen, however, the defender is helpless unless he has also constructed an effective terminal, or short-range, defense system.

The third kill mechanism—blast—can operate only in the atmosphere and requires little comment. Ordinarily when an offensive warhead reenters the atmosphere it is decelerated by a force that, at maximum, is on the order of 100 g. (One g is the acceleration due to the earth's gravity.) The increased atmospheric density reached within a shock wave from a nuclear explosion in air can produce a deceleration several times greater. But just as one can shield against neutrons and X rays one can shield against blast by designing the reentry vehicle to have great structural strength. Moreover, the defense, not knowing the detailed design of the reentry vehicle, has little way of knowing if it has destroyed a given vehicle by blast until the warhead either goes off or fails to do so.

The main difficulty for the defense is the fact that in all probability the offensive reentry vehicle will not arrive as a single object that can be tracked and fired on but will be accompanied by many other objects deliberately placed there by the offense. These objects come under the heading of penetration aids. We shall discuss only a few of the many types of such aids. They include fragments of the booster rocket, decoys, fine metal wires called chaff, electronic countermeasures and blackout mechanisms of several kinds.

The last stage of the booster that has propelled the offensive missile may disintegrate into fragments or it can be fragmented deliberately. Some of the pieces will have a radar cross section comparable to or larger than the cross section of the reentry vehicle itself. The defensive radar therefore has the task of discriminating between a mass of debris and the warhead. Although various means of discrimination are effective to some extent, radar and data processing must be specifically set up for this purpose. In any case the radar must deal with tens of objects for each genuine target, and this imposes considerable complexity on the system.

There is, of course, an easy way to discriminate among such objects: let the whole swarm reenter the atmosphere. The lighter booster fragments will soon be slowed down, whereas the heavier reentry vehicle will continue to fall with essentially undiminished speed. If a swarm of objects is allowed to reenter, however, one must abandon the concept of area defense and construct a terminal defense system. If a nation insists on retaining a pure area defense, it must be prepared to shoot at every threatening object. Not only is this extremely costly but also it can quickly exhaust the supply of anti-missile missiles.

Instead of relying on the accidental targets provided by booster fragments, the offense

will almost certainly want to employ decoys that closely imitate the radar reflectivity of the reentry vehicle. One cheap and simple decoy is a balloon with the same shape as the reentry vehicle. It can be made of thin plastic covered with metal in the form of foil, strips or wire mesh. A considerable number of such balloons can be carried uninflated by a single offensive missile and released when the missile has risen above the atmosphere.

The chief difficulty with balloons is putting them on a "credible" trajectory, that is, a trajectory aimed at a city or some other plausible target. Nonetheless, if the defending force employs an area defense and really seeks to protect the entire country, it must try to intercept every suspicious object, including balloon decoys. The defense may, however, decide not to shoot at incoming objects that seem to be directed against non-vital targets; thus it may choose to limit possible damage to the country rather than to avoid all damage. The offense could then take the option of directing live warheads against points on the outskirts of cities, where a nuclear explosion would still produce radioactivity and possibly severe fallout over densely populated regions. Worse, the possibility that reentry vehicles can be built to maneuver makes it dangerous to ignore objects even 100 kilometers off target.

Balloon decoys, even more than booster fragments, will be rapidly slowed by the atmosphere and will tend to burn up when they reenter it. Here again a terminal ABM system has a far better chance than an area defense system to discriminate between decoys and warheads. One possibility for an area system is "active" discrimination. If a defensive nuclear missile is exploded somewhere in the cloud of balloon decoys traveling with a reentry vehicle, the balloons will either be destroyed by radiation from the explosion or will be blown far off course. The reentry vehicle presumably will survive. If the remaining set of objects is examined by radar, the reentry vehicle may stand out clearly. It can then be killed by a second interceptor shot. Such a shoot-look-shoot tactic may be effective, but it obviously places severe demands on the ABM missiles and the radar tracking system. Moreover, it can be countered by the use of small, dense decoys within the balloon swarms.

Moreover, it may be possible to develop decoys that are as resistant to X rays as the reentry vehicle and also are simple and compact. Their radar reflectivity could be made to simulate that of a reentry vehicle over a wide range of frequencies. The decoys could also be made to reenter the atmosphere—at least down to a fairly low altitude—in a way that closely mimicked an actual reentry vehicle. The design of such decoys, however, would require considerable experimentation and development.

Another way to confuse the defensive radar is to scatter the fine metal wires of chaff. If such wires are cut to about half the wavelength of the defensive radar, each wire will act as a reflecting dipole with a radar cross section approximately equal to the wavelength squared divided by 2π . The actual length of the wires is not critical; a wire of a given length is also effective against radar of shorter wavelength. Assuming that the radar wavelength is one meter and that one-mill copper wire is cut to half-meter lengths, one can easily calculate that 100 million chaff wires will weigh only 200 kilograms (440 pounds).

The chaff wires could be dispersed over a large volume of space; the chaff could be so dense and provide such large radar reflection that the reentry vehicle could not be seen against the background noise. The defense would then not know where in the large reflecting cloud the reentry vehicle is concealed. The defense would be induced to spend several interceptors to cover the entire

cloud, with no certainty, even so, that the hidden reentry vehicle will be killed. How much of the chaff would survive the defense nuclear explosion is another difficult question. The main problem for the attacker is to develop a way to disperse chaff more or less uniformly.

An active alternative to the use of chaff is to equip some decoys with electronic devices that generate radio noise at frequencies selected to jam the defensive radar. There are many variations on such electronic countermeasures, among them the use of jammers on the reentry vehicles themselves.

The last of the penetration aids that will be mentioned here is the radar blackout caused by the large number of free electrons released by a nuclear explosion. These electrons, except for a few, are removed from atoms or molecules of air, which thereby become ions. There are two main causes for the formation of ions: the fireball of the explosion, which produces ions because of its high temperature, and the radioactive debris of the explosion, which releases beta rays (high-energy electrons) that ionize the air they traverse. The second mechanism is important only at high altitude.

The electrons in an ionized cloud of gas have the property of bending and absorbing electromagnetic waves, particularly those of low frequency. Attenuation can reach such high values that the defensive radar is prevented from seeing any object behind the ionized cloud (unlike chaff, which confuses the radar only at the chaff range and not beyond).

Blackout is a severe problem for an area defense designed to intercept missiles above the upper atmosphere. The problem is aggravated because area-defense radar is likely to employ low-frequency (long) waves, which are the most suitable for detecting enemy missiles at long range. In some recent popular articles long-wave radar has been hailed as the cure for the problems of the ABM missile. It is not. Even though it increases the capability of the radar in some ways, it makes the system more vulnerable to blackout.

Blackout can be caused in two ways: by the defensive nuclear explosions themselves and by deliberate explosions set off at high altitude by the attacker. Although the former are unavoidable, the defense has the choice of setting them off at altitudes and in locations that will cause the minimum blackout of its radar. The offense can sacrifice a few early missiles to cause blackout at strategic locations. In what follows we shall assume for purposes of discussion that the radar wavelength is one meter. Translation to other wavelengths is not difficult.

In order to totally reflect the one-meter waves from our hypothetical radar it is necessary for the attacker to create an ionized cloud containing 10^9 electrons per cubic centimeter. Much smaller electron densities, however, will suffice for considerable attenuation. For the benefit of technically minded readers, the equation for attenuation in decibels per kilometer is

$$\alpha = \frac{4.34}{3 \times 10^5} \frac{\omega_p^2}{\omega^2 + \gamma_e^2} \gamma_e.$$

Here ω_p is the plasma frequency for the given electron density, ω is the radar frequency in radians per second and γ_e is the frequency of collisions of an electron with atoms of air. At normal temperatures, this frequency γ_e is the number 2×10^{11} multiplied by the density of the air (ρ) compared with sea-level density (ρ_0), or $\gamma_e = 2 \times 10^{11} \rho/\rho_0$. At altitudes above 30 kilometers, where an area-defense system will have to make most of its interceptions, the density of air is less than .01 of the density at sea level. Under these conditions the electron collision frequency γ_e is less than the value of $\omega = (2\pi \times 3 \times 10^8)$ and therefore can be neglected in

the denominator of the equation. Using that equation, we can then specify the number of electrons, N_e , needed to attenuate one-meter radar waves by a factor of more than one decibel per kilometer: $N_e > 350 \rho_0/\rho$. At an altitude of 30 kilometers, where ρ_0/ρ is about 100, N_e is about 3×10^9 , and at 60 kilometers N_e is still only about 3×10^8 . Thus the electron densities needed for the substantial attenuation of a radar signal are well under the 10^9 electrons per cubic centimeter required for total reflection. The ionized cloud created by the fireball of a nuclear explosion is typically 10 kilometers thick; if the attenuation is one decibel per kilometer, such a cloud would produce a total attenuation of 10 decibels. This implies a tenfold reduction of the outgoing radar signal and another tenfold reduction of the reflected signal, which amounts to effective blackout.

The temperature of the fireball created by a nuclear explosion in the atmosphere is initially hundreds of thousands of degrees centigrade. It quickly cools by radiation to about 5,000 degrees C. Thereafter cooling is produced primarily by the cold air entrained by the fireball as it rises slowly through the atmosphere, a process that takes several minutes.

When air is heated to 5,000 degrees C., it is strongly ionized. To produce a radar attenuation of one decibel per kilometer at an altitude of 90 kilometers the fireball temperature need be only 3,000 degrees, and at 50 kilometers a temperature of 2,000 degrees will suffice. Ionization may be enhanced by the presence in the fireball of iron, uranium and other metals, which are normally present in the debris of nuclear explosion.

The size of the fireball can easily be estimated. Its diameter is about one kilometer for a one-megaton explosion at sea level. For other altitudes and yields there is a simple scaling law: the fireball diameter is equal to $(Y \rho_0/\rho)^{1/3}$, where Y is the yield in megatons. Thus a fireball one kilometer in diameter can be produced at an altitude of 30 kilometers (where $\rho_0/\rho = 100$) by an explosion of only 10 kilotons. At an altitude of 50 kilometers (where $\rho_0/\rho = 1,000$), a one-megaton explosion will produce a fireball 10 kilometers in diameter. At still higher altitudes matters become complicated because the density of the atmosphere falls off so sharply and the mechanisms of heating the atmosphere changes. Nevertheless, fireballs of very large diameter can be expected when megaton weapons are exploded above 100 kilometers. These could well black out areas of the sky measured in thousands of square kilometers.

For explosions at very high altitudes (between 100 and 200 kilometers) other phenomena become significant. Collisions between electrons and air molecules are now unimportant. The condition for blackout is simply that there be more than 10^9 electrons per cubic centimeter.

At the same time very little mass of air is available to cool the fireball. If the air is at first fully ionized by the explosion, the air molecules will be dissociated into atoms. The atomic ions combine very slowly with electrons. When the density is low enough, as it is at high altitude, the recombination can take place only by radiation. The radiative recombination constant (call it C_R) is about 10^{-12} cubic centimeter per second. When the initial electron density is well above 10^9 per cubic centimeter, the number of electrons remaining after time t is roughly equal to $1/C_R t$. Thus if the initial electron density is 10^{12} per cubic centimeter, the density will remain above 10^9 for 1,000 seconds, or some 17 minutes. The conclusion is that nuclear explosions at very high altitude can produce long-lasting blackouts over large areas.

The second of the two mechanisms for producing an ionized cloud, the beta rays issuing from the radioactive debris of a nuclear explosion, can be even more effective than the fireball mechanism. If the debris

is at high altitude, the beta rays will follow the lines of force in the earth's magnetic field, with about half of the beta rays going immediately down into the atmosphere and the other half traveling out into space before returning earthward. These beta rays have an average energy of about 500,000 electron volts, and when they strike the atmosphere, they ionize air molecules. Beta rays of average energy penetrate to an altitude of about 60 kilometers; some of the more energetic rays go down to about 50 kilometers. At these levels, then, a high-altitude explosion will give rise to sustained ionization as long as the debris of the explosion stays in the vicinity.

One can show that blackout will occur if $y \times t^{-1.2} > 10^{-2}$, where t is the time after the explosion in seconds and y is the fission yield deposited per unit horizontal area of the debris cloud, measured in tons of TNT equivalent per square kilometer. The factor $t^{-1.2}$ expresses the rate of decay of the radioactive debris. If the attacker wishes to cause a blackout lasting five minutes ($t=300$), he can achieve it with a debris level y equal to 10 tons of fission yield per square kilometer. This could be attained by spreading one megaton of fission products over a circular area about 400 kilometers in diameter at an altitude of, say, 60 kilometers. Very little could be seen by an area-defense radar attempting to look out from under such a blackout disk. Whether or not such a disk could actually be produced is another question. Terminal defense would not, of course, be greatly disturbed by a beta ray blackout.

The foregoing discussion has concentrated mainly on the penetration aids that can be devised against an area-defense system. By this we do not mean to suggest that a terminal-defense system can be effective, and we certainly do not wish to imply that we favor the development and deployment of such a system.

Terminal defense has a vulnerability all its own. Since it defends only a small area, it can easily be bypassed. Suppose that the 20 largest American cities were provided with terminal defense. It would be easy for an enemy to attack the 21st largest city and as many other undefended cities as he chose. Although the population per target would be less than if the largest cities were attacked, casualties would still be heavy. Alternatively the offense could concentrate on just a few of the 20 largest cities and exhaust their supply of antimissile missiles, which could readily be done by the use of multiple warheads even without decoys.

It was pointed out by Charles M. Herzfeld in *The Bulletin of the Atomic Scientists* a few years ago that a judicious employment of ABM defenses could equalize the risks of living in cities of various sizes. Suppose New York, with a population of about 10 million, were defended well enough to require 50 enemy warheads to penetrate the defenses, plus a few more to destroy the city. If cities of 200,000 inhabitants were left undefended, it would be equally "attractive" for an enemy to attack New York and penetrate its defenses as to attack an undefended city.

Even if such a "logical" pattern of ABM defense were to be seriously proposed, it is hard to believe that people in the undefended cities would accept their statistical security. To satisfy everyone would require a terminal system of enormous extent. The highest cost estimate made in public discussions, \$50 billion, cannot be far wrong.

Although such a massive system would afford some protection against the U.S.S.R.'s present armament, it is virtually certain that the Russians would react to the deployment of the system. It would be easy for them to increase the number of their offensive warheads and thereby raise the level of expected damage back to the one now estimated. In his recent forecast of defense needs for the next five years, Secretary Mc-

Namara estimated the relative cost of ABM defenses and the cost of countermeasures that the offense can take. He finds invariably that the offense, by spending considerably less money than the defense, can restore casualties and destruction to the original level before defenses were installed. Since the offense is likely to be "conservative," it is our belief that the actual casualty figures in a nuclear exchange, after both sides had deployed ABM systems and simultaneously increased offensive forces, would be worse than these estimates suggest.

Any such massive escalation of offensive and defensive armaments could hardly be accomplished in a democracy without strong social and psychological effects. The nation would think more of war, prepare more for war, hate the potential enemy and thereby make war more likely. The policy of both the U.S. and the U.S.S.R. in the past decade has been to reduce tensions to provide more understanding, and to devise weapon systems that make war less likely. It seems to us that this should remain our policy.

STATEMENT BY SECRETARY OF DEFENSE ROBERT S. McNAMARA

Before I discuss the analytical basis for these conclusions and our specific program proposals, I would first like to present the latest estimates of the strategic threat.

B. THE SIZE AND CHARACTER OF THE THREAT

Each year in presenting our projections of the strategic nuclear threat to the United States, I have cautioned that while we have reasonably high confidence in our estimates for the closer-in period, our estimates for the more distant years are subject to considerable uncertainty. This is still the case with regard to our current projections. The estimates through 1969 are reasonably firm. Beyond that point they become progressively less firm, especially where they deal with the period beyond the production and deployment leadtimes of the weapons systems involved.

1. The Soviet strategic offensive-defensive forces

Summarized in the following table are the Soviet strategic offensive forces estimated for October 1, 1967. The programmed U.S. forces for those same dates are shown for comparison:

UNITED STATES VERSUS SOVIET INTERCONTINENTAL STRATEGIC NUCLEAR FORCES

	Oct. 1, 1967	
	United States ¹	U.S.S.R.
ICBM launchers ²	1,054	720
SLBM launchers ³	656	30
Total, intercontinental missile launchers.....	1,710	750
Intercontinental bombers.....	697	155
Total force loadings, approximate number of warheads.....	4,500	1,000

¹ These are mid-1967 figures.

² Excludes ICBM test range launchers which could have some operational capability against the United States. Soviets also have MR/IRBM's capable of striking Eurasian targets.

³ In addition to the SLBM's on nuclear-powered submarines the Soviets also have SLBM's on diesel-powered submarines whose primary targets are believed to be strategic land targets in Eurasia. The Soviets also have submarine-launched cruise missiles whose primary targets we believe to be naval and merchant vessels.

⁴ In addition to the intercontinental bombers, the Soviets have a force of medium bombers/tankers capable of striking Eurasian targets.

a. Intercontinental Ballistic Missiles

Over the past year, the Soviets have continued their build-up of hardened and dispersed land-based missiles. We estimate that as of 1 October 1967 they had a total of 720 ICBM launchers operational compared to 340 a year earlier. We believe the Soviet ICBM force will continue to grow over the next few

years, but at a considerably slower rate than in the recent past.

As you may recall, I announced last November that the Soviets were intensively testing what we believe to be a Fractional Orbit Bombardment System (FOBS). Such a system—which is really an ICBM of different trajectory—could be launched on a very low trajectory across the northern approaches of the United States, thus reducing the possibility of timely detection by the Ballistic Missile Early Warning System (BMEWS); or, alternatively, around the southern approaches which are not covered by BMEWS. In either event, the weapon would not have a very high order of accuracy and would have to pay a heavy penalty in payload. It would, therefore, be useful primarily against soft targets. Although years ago we considered and rejected such a system for our own use, the Soviets may believe it to be useful in a surprise nuclear strike against our bomber bases or as a penetration tactic against ABM systems. Later, in my discussion of the defensive programs, I will touch on some of the measures we have taken in anticipation of that type of threat.

b. Antiballistic Missile Defense

Last year I noted that in addition to the GALOSH system around Moscow, the Soviets were deploying another type of defensive system elsewhere in the Soviet Union. I cautioned, however that the weight of the evidence at the time suggested that this system was not intended primarily for antiballistic missile defense. Now, I can tell you that the majority of our intelligence community no longer believes that this so-called "Tallinn" system (which is being deployed across the northwestern approaches to the Soviet Union and in several other places) has any significant ABM capability. This system is apparently designed for use within the atmosphere, most likely against an aerodynamic rather than a ballistic missile threat.

Although construction of the Galosh ABM system around Moscow is proceeding at a moderate pace, no effort has been made during the last year to expand that system or extend it to other cities. It is the consensus of the intelligence community that this system could provide a limited defense of the Moscow area but that it could be seriously degraded by sophisticated penetration aids. Nevertheless, knowing what we do about past Soviet predilections for defensive systems, we must, for the time being, plan our forces on the assumption that they will have deployed some sort of an ABM system around their major cities by the early 1970s.

2. Red Chinese nuclear threat

Our current estimates of the Red Chinese nuclear threat are essentially the same as those I presented here last year. The Chinese have the technical and industrial capabilities required for the deployment of ballistic missiles and we believe that they are making an intensive effort to develop a medium range missile. We estimate that the first of these missiles could be deployed as early as 1967-68 and that by the mid-1970s, they could have a modest force operational.

With regard to ICBMs, we continue to believe that the Chinese nuclear weapons and ballistic missile development programs are being pursued with a high priority. However, it is now clear that they failed to conduct either a space or a long-range ballistic missile launching before the end of 1967, as we thought possible last year. We still believe such a launching could be made on relatively short notice. In any event, our estimate last year that it appeared unlikely the Chinese could achieve an IOC with an ICBM before the early 1970s, or deploy a significant number of operational ICBMs before the mid-1970s, still holds. And, of course, those ICBMs would not have a very high degree of reliability, speed of response or protection against attack.

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The Red Chinese also have several types of aircraft which could carry nuclear weapons, but most of them have a limited operational radius and none have an intercontinental radius. It is highly unlikely on the basis of cost alone that they would undertake the development, production and deployment of an intercontinental bomber force. If they chose to do so, it would take them a decade or more before they could deploy such a force.

C. CAPABILITIES OF THE PROPOSED U.S. FORCES FOR "ASSURED DESTRUCTION"

As I noted earlier, the only true measure of the effectiveness of our "Assured Destruction" forces is their ability, even after absorbing a well-coordinated surprise first strike, to inflict unacceptable damage on the attacker. In this next portion of my Statement, I would like to examine with you our latest analyses of how well our strategic forces can be expected to accomplish that mission: first, against the "highest expected threat" projected in the latest National Intelligence Estimates and, second, against a Greater-Than-Expected Threat.¹

1. Capability against the "highest expected threat" in the NIE

Even if the Soviet strategic forces by 1972 reach the higher end of the range of estimates projected in the latest NIEs and even if they were to assign their entire available missile force to attacks on our strategic forces (reserving only refire missiles and bomber-delivered weapons for urban targets), about one-half of our forces programmed for 1972 would survive and remain effective. If the Soviets expand the Moscow ABM defense and deploy the same or a similar system around other cities at the highest rate projected in the latest NIEs, about three-quarters of our surviving weapons would detonate over their targets. The destructive potential of such a U.S. retaliatory attack is illustrated by the following table:

SOVIET POPULATION AND INDUSTRY DESTROYED

[Assumed 1972 total population of 247,000,000; urban population of 116,000,000]

	Total population fatalities		Industrial capacity destroyed (percent)
	Millions	Percent	
1 megaton equivalent delivered warheads:			
100.....	37	15	59
200.....	52	21	72
400.....	74	30	76
800.....	96	39	77
1,200.....	109	44	77
1,600.....	116	47	77

Even if the Soviets deploy a substantial number of ABM interceptors by 1972, our strategic missile forces alone could still destroy more than two-fifths of their total population (more than 100 million people), and over three-quarters of their industrial capacity. As the foregoing table demonstrates, beyond 400 one-megaton equivalents optimally delivered, further increments would not meaningfully change the amount of damage inflicted because we would be bringing smaller and smaller cities under attack.

These results, of course, reflect the decisions we have taken in recent years to en-

¹ The "highest expected threat" is actually composed of the upper range of NIE projections for each element of the Soviets' strategic forces. In many cases, these represent alternatives and it is highly unlikely that all elements would ever reach the top end of the quantitative range simultaneously. Therefore, the "highest expected threat" is really a greater threat than that projected in the NIE.

hance the future capabilities of our "Assured Destruction" forces, including:

1. The production and deployment of the POSEIDON missile with MIRVs.
2. The production and deployment of improved missile penetration aids.
3. The increase in the proportion of MINUTEMAN IIIs (with MIRVs and a new improved third stage) in the planned force.
4. The initiation of development of new small reentry vehicles in order to increase substantially the number of warheads (or penetration aids) which can be carried by a single missile.
5. The development and production of SRAMs for our strategic bombers.

These and other measures will not only enhance the survivability of our strategic missile forces but will also greatly increase the number of weapons which we could place over the Soviet Union in 1972. As I stated earlier, numbers of weapons will be much more important in the future than gross megatonnage. Our calculations show that, even if the Soviets deploy a substantial number of ABMs by 1972, our offensive forces (after absorbing a surprise attack) would still be able to inflict about the same percent fatalities on the Soviet population in a second strike in 1972 as they could have in 1966.

Indeed, if the Soviet offensive-defensive threat does not increase beyond the highest level now projected through 1972 in the latest National Intelligence Estimates, we will have more "Assured Destruction" capability than we will probably need. However, I have repeatedly cautioned that our "Assured Destruction" capability is of such crucial importance to our security that we must be prepared to cope with Soviet strategic threats which are greater than those projected in the latest intelligence estimates. Accordingly, we must continually reexamine the various actions, beyond those which now seem probable, by which the Soviets might seek to strengthen their strategic forces and take appropriate steps in a timely manner to hedge against them.

2. Capability against "greater-than-expected threats"

As was the case last year, the most severe threat we must consider in planning our "Assured Destruction" forces is a Soviet deployment of a substantial hard target kill capability in the form of highly accurate small ICBMs or MIRVed large ICBMs, together with an extensive, effective ABM defense. A large Soviet ICBM force with a substantial hard target kill capability might be able to destroy a large number of our Minuteman missiles in their silos. An extensive, effective Soviet ABM defense might then be able to intercept and destroy a large part of our residual missile warheads, including those carried by submarine-launched missiles. In combination, therefore, these two actions could conceivably seriously degrade our "Assured Destruction" capability.

Again, I want to remind you that both of these threats are quantitatively far greater than those projected in the latest intelligence estimates. Moreover, we believe that the accuracy of Soviet ICBMs is still substantially inferior to that of our own missiles. Nevertheless, even though such a threat is extremely unlikely, we have taken account of the possibility in our longer range force planning.

Our calculations show that against either one of the Soviet Greater-Than-Expected Threats, the offensive or the defensive threat, the presently programmed forces could still perform their missions through the mid-1970s.

Against the massive and highly unlikely combined Greater-Than-Expected Offensive and Defensive Threats, these same forces with POSEIDON missiles carrying a full load of warheads and with bomber penetration aids (options which we could exercise in FY 1970) could still destroy in a second strike (de-

pending upon how we target our forces) about 18 to 25 percent of the population and two-thirds to three-quarters of the industrial capacity of the Soviet Union, even after absorbing a surprise attack. The prospect of having to absorb losses of this magnitude from a U.S. retaliatory strike should, in itself, pose a very substantial deterrent to the Soviet Union. Nevertheless, for the purpose of planning our forces so far ahead, this level of damage may become too low for complete confidence in our deterrent. Accordingly, prudence dictates that we act now to place ourselves in a position to strengthen our "Assured Destruction" capabilities in the unlikely event that both of the Greater-Than-Expected Threats actually begin to emerge.

Fortunately, we have a large number of additional options from which we can draw to strengthen those capabilities by the mid-1970s. We can convert the entire force to Minuteman III, increase the number of warheads each Minuteman missile could carry, emplace the entire Minuteman III force in superhard silos, and/or protect the Minuteman force with an ABM defense.

There are, of course, still other options available, such as the construction and deployment of more Poseidon submarines, and the development and production of a new land-based missile. Although a new land-based ICBM does not appear to offer any particular advantage over the Minuteman III in superhard silos, I believe we should keep that option open by starting development now of a silo which could be used for either the Minuteman III or a new ICBM. The options of defending Minuteman with the ABM and of constructing more Poseidon submarines will continue to be available for some time into the future and neither requires a commitment at this time.

As I noted in previous years, under certain circumstances there may be some advantage in maintaining a mixed offensive force of missiles and a limited number of bombers. By having a capability to attack some cities with missiles only, and others with bombers only, we can force the Soviet Union to maintain defenses against both. But to do this, we do not need either a very large bomber force or a new bomber. The present program provides for a mixed force of missiles and bombers into the latter part of the 1970s, and the options open to us will permit extending the life of the bomber force and increasing its capability, and/or the addition of a new bomber, should threats greater than that projected by the NIE develop.

Against the Greater-Than-Expected Threat, any bomber force ought to be equipped with improved penetration aids to cope with the kind of anti-bomber defense systems postulated in this threat. We have no evidence the Soviets are actually deploying such systems, although they are developing new high performance fighter aircraft. Nevertheless, we should keep the options open to upgrade our presently programmed bomber force and to deploy a new bomber if one should eventually be required. But the pacing items at the present time are the penetration aids, particularly those needed to counter the improved interceptors the Soviets may deploy in the future, and these are the programs which should receive our first attention regardless of which option we may ultimately choose to exercise.

Again, may I remind you that all of these missile and bomber options are directly related to the combined Greater-Than-Expected Threat, and until we have some evidence that this threat is actually beginning to emerge, we need not and should not decide to deploy any of these systems. Instead, we should carefully time our actions on all of them in step with the development of the threat, keeping in mind the various development, production and deployment leadtimes involved.

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D. CAPABILITIES OF THE PROPOSED FORCES FOR DAMAGE LIMITATION

There are two major issues this year in the Damage Limitation portion of the Strategic Forces Program. The first concerns the deployment of an anti-ballistic missile defense and, the second, the future size and composition of the anti-bomber defense forces.

1. Anti-ballistic missile defense

Last year I presented to you in considerable detail our analysis of the anti-ballistic missile defense issue. I described the three major purposes for which we might want to deploy an ABM system, the kinds of radars and missiles which would be involved, the technical uncertainties which still remained to be resolved, and the costs and benefits of some of the alternative deployments. With regard to the three purposes, I concluded that:

1. The deployment of an ABM defense for MINUTEMAN might offer a partial substitute for the further expansion of our offensive forces in the event the Greater-Than-Expected Soviet threat began to emerge.

2. The deployment of an austere ABM defense against a Red Chinese ICBM threat might offer a high degree of protection to the entire Nation, at least through the 1970s.

3. The deployment of an ABM defense for the protection of our cities against the kind of heavy, sophisticated missile attack the Soviets could launch in the 1970s would almost surely cause them to react by increasing the capabilities of their offensive forces, thus leaving us in essentially the same position we were before.

Further study of this issue during the last year has served to confirm these conclusions. Since I have already touched on the first purpose in connection with the analysis of our "Assured Destruction" capabilities against the Greater-Than-Expected Soviet threat, I will limit my discussion at this point to the other two purposes.

a. Defense Against the Red Chinese Nuclear Threat

As I noted earlier, there is mounting evidence that the Red Chinese are devoting very substantial resources to the development of both nuclear warheads and missile delivery systems. Within a period of 39 months, they detonated seven nuclear devices. The first, in October 1964, was an all U-235 fission test with a low yield; the second, in May 1965, was a similar test with a low-intermediate yield. In May 1966 they detonated their first device involving thermonuclear material. Then, in October 1966, they tested their first missile-delivered device with a low yield fission warhead, thus demonstrating sufficient engineering skill to conduct a missile-warhead systems test. In December 1966, they detonated their second device involving thermonuclear material. In June 1967, they detonated a device with a yield of a few megatons dropped from an airplane. Finally, last December, they detonated another device, but this test was apparently a partial failure.

These seven nuclear tests, taken together with their continuing work on surface-to-surface missiles, lead us to believe that they are moving ahead with the development of an ICBM. Indeed, if their programs proceed at the present pace, they could have a modest force of ICBMs by the mid-1970s.

In the light of this progress in nuclear weapons and missile delivery systems, it seemed both prudent and feasible to us last September to initiate the deployment of an austere Chinese-oriented ABM defense. We knew from our continuing study of this system that it could be deployed at an investment cost of about \$5 billion, and could be highly effective against the kind of threat a Chinese force might pose in the 1970s.

As presently defined, the Sentinel ABM system (i.e., the system specifically designed against the Chinese threat) would consist of

Perimeter Acquisition Radars (PARs), Missile Site Radars (MSRs), long range Spartan area defense missiles and, later, some Sprint local defense missiles for certain special purposes. The effectiveness of this deployment in reducing U.S. fatalities from a Red Chinese attack in the 1970s is shown in the table following:

U.S. FATALITIES FROM A CHINESE FIRST STRIKE, 1970's

	[In millions]		
	Number of Chinese ICBM's		
	X	2.5X	7.5X
U.S. fatalities:			
Without Sentinel.....	7	11	15
With Sentinel.....	(1)	(1)	1

¹ Fewer than 1,000,000 U.S. dead with some probability of no deaths.

It is apparent from the foregoing table that the Sentinel system, facing a relatively "primitive" attack, could probably hold U.S. fatalities below one million. Obviously, if and when the Chinese ICBM force grows, quantitatively and qualitatively, beyond the levels shown in the foregoing table, additions and improvements would probably have to be made in the Sentinel system. We believe, however, that for relatively modest additional outlays the system could be improved so as to limit the Chinese damage potential to low levels into the mid-1980s. The Sentinel system would also have a number of other advantages. It would provide an additional

indication to the people of Asia that we intend to support them against nuclear blackmail from China, and thus help to convince the non-nuclear countries that acquisition of their own nuclear weapons is not required for their security. Furthermore, this initial deployment would serve as a foundation to which we could add a defense for our Minuteman force if that later becomes desirable. Finally, it could protect our population against the improbable, but possible, accidental launch of a few ICBMs by any one of the nuclear powers.

b. Deployment of Nike-X for Defense of Our Cities Against Soviet Attack.

Nothing has occurred during the last year to change my conviction that the deployment of the Nike-X system for the defense of our cities against a Soviet attack would, under present circumstances, be a futile waste of our resources. I believe it is clear from my earlier discussion of the trends in the nature of the threat, as evaluated by our intelligence community, that the Soviets are determined to maintain a nuclear deterrent against the United States. If this is true, as I believe it is, any attempt on our part to reduce their "Assured Destruction" capability below what they might consider necessary to deter us would simply cause them to respond with an offsetting increase in their offensive forces. It is precisely this process of action and reaction upon which the arms race feeds, at great cost to both sides and benefit to neither. This point is illustrated in the table on the following page which is based on nuclear strike capabilities as they might be viewed by the potential adversaries.

NUMBERS OF FATALITIES IN AN ALL-OUT STRATEGIC EXCHANGE, MID-1970's¹

U.S. program	Soviet response	[In millions]			
		Soviets strike first against military and city targets; United States retaliates against cities		United States strikes first at military targets; Soviets retaliate against U.S. cities; United States retaliates against Soviet cities	
		U.S. fatalities	Soviet fatalities	U.S. fatalities	Soviet fatalities
No ABM.....	None.....	120	120	120	80
Sentinel.....	None.....	100	120	90	80
	Pen-Aids.....	120	120	110	80
	None.....	40	120	10	80
Posture A.....	MIRV, Pen-Aids.....	110	120	60	80
	Plus 100 mobile ICBM's.....	110	120	90	80
	None.....	20	120	10	80
Posture B.....	MIRV, Pen-Aids.....	70	120	40	80
	Plus 550 mobile ICBM's.....	100	120	90	80

¹ At fatality levels approximating 100,000,000 or more, differences of 10,000,000 to 20,000,000 in the calculated results are less than the margin of error in the estimates.

"Posture A" is a light defense against a Soviet missile attack on our cities. It consists of an area defense of the entire continental United States, providing redundant (overlapping) coverage of key target areas, and, in addition, a relatively low-density Sprint defense of 25 cities to provide some protection against those warheads which get through the area defense. "Posture B" is a heavier defense with the same area coverage, but with much greater sophistication in its electronics and a higher-density Sprint defense for 52 cities.

Postures A and B would also require some improvement in our defense against manned bomber attack in order to preclude the Soviets from undercutting the ABM defense; we would also want to expand and improve our anti-submarine warfare forces to help defend against Soviet missile-launching submarines. The "current" estimates of the investment cost of the total "Damage Limiting" package are at least \$13 billion for Posture A and at least \$22 billion for Posture B. On the basis of past experience, however, actual costs would more likely be \$40 billion by the time the system had been completed.

Cost, however, is not the problem. If we could actually build and deploy a genuinely impenetrable shield over the United States, we would be willing to spend \$40 billion. But, if after spending these tens of billions of dollars, we could still expect to find ourselves in a position where a Soviet attack could inflict unacceptable damage on our population because of their response to our defensive efforts, I do not see how we would have really improved our security or freedom of action. And neither can I see how the Soviets will have improved their security and freedom of action if after all their additional expenditures for offensive and defensive systems, we can still inflict unacceptable damage on them, even after absorbing their first strike. For this reason we have come to the conclusion that both sides would be far better off if we can reach an agreement on the limitation of all strategic nuclear forces, including ABMs.

In any event, there is no point whatever in our responding to a massive ABM deployment on their part with a massive ABM deployment of our own. Instead, we should act realistically and further strengthen our offensive forces, if and when necessary, to

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preserve our "Assured Destruction" capability.

E. STRATEGIC OFFENSIVE FORCES

The force structure proposed for the FY 1969-73 period is shown on a classified table provided to the Committee.

1. Missile forces

In overall terms the missile forces we are proposing for the FY 1969-73 period are essentially the same as those I discussed last year—1,000 Minuteman, 496 Poseidon and 160 Polaris, plus 54 Titan IIs. Within these overall numbers, however, we are proposing some changes in mix and payload.

a. Minuteman

Last year I told you that in order to increase the capability of our offensive forces against a possible strong Soviet ABM defense, we proposed to increase the number of Minuteman IIIs in the force. I also pointed out that by FY 1973-74 it would probably become necessary to replace the earliest Minuteman II missiles, and that we could then add more Minuteman IIIs if that should appear desirable.

Although the Soviet ABM deployment is not moving forward as fast as anticipated last year, we now believe it would be desirable to increase the number of Minuteman IIIs. And, as I indicated earlier, we have included funds in the FY 1969 Budget for the development of dual-purpose super-hard silos for the Minuteman or a new land-based ICBM. Because the development program for the Minuteman III is taking longer than we had planned, and because we want to pursue a more efficient overall Minuteman modernization schedule, initial deployment of the Minuteman III will slip some months behind the schedule envisioned last year. The phase out of Minuteman I will be slowed down to compensate for the slip in the Minuteman III program.

b. Titan II

Although the Titan II will decline in importance as the Minuteman III and the Poseidon are deployed, it may be advisable to retain the present force of 54 missiles on launchers. Its heavy payload would be useful against large soft targets which are not defended by ABMs. On the basis of a recent review of the Titan II follow-on test program, we now believe that four tests per year, instead of six, will be enough to ensure that the missiles in the force are operationally reliable. Thus, with the procurement of a small number of missiles in FY 1969-70, we can maintain the present force of 54 Titan missiles on launchers throughout the program period, instead of allowing it to decline after FY 1970 as we planned last year.

c. Polaris-Poseidon

The Polaris-Poseidon program is essentially the same as the one I presented here last year. Thirty-one of the 41 Polaris submarines, all of which have now become operational, will be refitted with the Poseidon missile. The other ten (five 598-Class and five 608-Class) cannot be refitted without replacing the center section of their hulls. The cost would be about equal to that of a new submarine, and even then they would not be as good as the other 31. Accordingly, these submarines will continue to carry the Polaris missile. The five 598-Class ships, which originally carried the A-1, have already been refitted with the A-3. The five 608-Class ships, which now carry the A-2, will be refitted with the A-3 during their second overhaul. The proposed FY 1969 shipbuilding and conversion program includes funds for six Poseidon conversions and advance procurement for nine more.

d. New Strategic Missile Systems

Last year I told you that we are making a comprehensive study of new strategic missile systems. This study was completed last sum-

mer, and on the basis of its findings we have included \$56 million in the FY 1969 Budget for advanced ICBM technology.

b. Manned Interceptors

The ultimate U.S. manned interceptor force will consist of modified F-106Xs (supported by C-130s which would be used to move ground crews and equipment to the dispersal recycle bases), plus an Air National Guard F-102 squadron in Hawaii. This squadron, together with the search radars, will continue to provide a local air defense capability for that remote state. We plan to start the phase-down of the interceptor forces in FY 1969.

c. Surface-to-Air Missiles

On the basis of our present plans, all of the Bomarc force would be phased out when the full F-106X force becomes operational. Most of the Hercules and all of the Hawks, however, will be retained.

2. Missile and space defense

The decision to deploy a Chinese-oriented ABM defense system will undoubtedly have an important impact on other strategic defensive programs. For example, we already know that the Perimeter Acquisition Radar (PAR) planned for the Sentinel system could also be made to handle some of the long-range acquisition and tracking functions presently performed by the three BMEWS sites. Conversely, the over-the-horizon (back-scatter) radars planned for the anti-bomber defense could also be used to provide limited detection and tracking of ballistic missiles launched from submarines. Moreover, in order to provide a backup for BMEWS, we have already deployed several Over-the-Horizon (forward-scatter) radar transmitters and receivers, and we have under active development for a number of years a satellite-borne missile warning system which now appears to be capable of providing earlier warning than BMEWS. (The forward-scatter OTH and the satellite-borne missile warning system are two of the measures I alluded to in my earlier discussion of the Soviet FOBS.) Clearly, the time has come when we must systematically examine all of these warning systems in relation to one another, with a view to eliminating unnecessary redundancy and ensuring that the remaining systems are truly integrated into a workable whole. Accordingly, I have recently asked the Joint Chiefs of Staff to establish a Joint Continental Defense System Integration Planning Staff to study this entire problem in depth, including the function of all defensive systems in a wartime environment.

a. Missile Warning

Pending the completion of the aforementioned study, we are not proposing any changes in the BMEWS program. However, we are making certain changes in the siting of the Over-the-Horizon (forward-scatter) radar program. These radars have demonstrated a very high order of capability. Although originally designed to detect ICBM launches (including FOBS), these radars have demonstrated a good capability to detect smaller ballistic missiles.

As I indicated earlier, we are developing a back-scatter OTH radar for use in the anti-bomber defense. In this system, echo signals from the target are returned directly to the transmitter, thereby eliminating the need for separate receiver stations. It is also more effective than the forward-scatter system in locating and tracking vehicles moving through and below the ionosphere, for example, aircraft or SLBMs. We presently plan to begin installing the first back-scatter OTH radar in the near future. While the chief function of this radar will be research and development, we hope that it will also provide some useful operational data. It will also give us an opportunity to test the back-scatter system in the ICBM warning role.

b. Anti-Ballistic Missile Defense (Sentinel)

As previously mentioned, the Sentinel system will consist of PAR and MSR radars and Spartan and Sprint missiles.

The PAR is a low frequency phased-array radar used for long-range surveillance, acquisition and tracking. The presently planned characteristics of this radar place its design well within the "state-of-the-art", and for this reason the first PAR can be installed directly at its tactical site rather than at a field test site. Its performance can be simulated by an ARPA Altair radar already at Kwajalein, for purposes of the full systems tests.

The MSR is a phased-array radar used to control the Sprint and Spartan interceptors. It can perform much the same functions as the larger MAR, which is not required in a limited deployment, but on a smaller scale. The MSR was tested at the contractor's plant before being sent to Kwajalein, where it is currently being installed for the full systems tests. The MAR, which is the most sophisticated component of the Nike-X system, will remain in an R&D status. A Tacmar (a smaller version of the MAR) will be installed at Kwajalein for final design and testing.

The Spartan missile, as presently designed, will have three stages and utilize an advanced warhead, and should be able to intercept objects at ranges in excess of several hundred miles and at exoatmospheric altitudes. However, we now plan to make some further improvements in the Spartan to enhance its capability against a Fobs. The Spartan will also be included in the full systems tests planned at Kwajalein.

The Sprint missile is designed to attack incoming warheads after the atmosphere has helped to separate out the accompanying decoys, chaff, etc. The missile is capable of climbing thousands of feet in a few seconds to make intercepts between 5,000 and 100,000 feet at ranges between 15-25 miles. It uses a "pop-up" launch technique in which the missile is ejected from its tube by the generation of gas pressure on the piston upon which it rests. Actual ignition does not take place until after the missile has left the tube. This technique conserves propellant, allows the missile to "get away" sooner and reduces the missile size. Initial flight tests are currently being conducted at the White Sands Missile Range, and beginning in early 1969 the missile will be tested at Kwajalein, where the overall systems tests against actual ICBMs fired from Vandenberg Air Base will be conducted.

Although, as stated earlier, ABM systems to protect population centers against large sophisticated attacks do not appear practical, we will continue to explore new technical approaches to this objective. The Nike-X development program will be used for this purpose. In addition, we will continue to support a number of other ABM related programs, particularly ARPA's Project Defender.

In total, the FY 1969 Budget request includes about \$1,232 million for ABM defense: \$651 million for the deployment of Sentinel (in addition to \$229 million in FY 1968); \$313 million for Sentinel development; \$165 million for ABM advanced development (Nike-X); and \$103 million for Defender. In addition, the AEC's FY 1969 budget includes funds for ABM warhead development and production.

c. Anti-Satellite Defense

As described in previous years, we have a capability to intercept and destroy hostile satellites within certain ranges. This capability will be maintained throughout the program period.

Spasur and Spacetrack are our satellite tracking and identification systems in the Norad Spadat system. The Spasur system is designed to give a warning when a new space

object passes through its field, and the Spacetrack system detects, tracks and computes the orbits of objects in space. Both systems are tied to the North American Air Defense Command.

One of the projects that the Joint Continental Defense Systems Integration Planning Staff will undertake is the development of a master plan for the evolution of these two systems. The ever-growing population of space objects and "junk" that must be identified and tracked means that we will have to make major improvements in these systems in the near future. In the case of the Spacetrack system, we have included funds in the FY 1969 Budget for the modification of the data processing and communications equipment at existing sites and for some new construction at these sites. Any further improvements or expansion will be delayed pending a full study of the requirements for electro-optical sites in addition to the camera and radar sites, the links with the Sentinel system, the need for a separate data processing center, etc.

G. CIVIL DEFENSE

The Civil Defense program proposed for FY 1969 contemplates no important change in basic objectives from those which I discussed last year. However, we have held the FY 1969 program to the lowest possible sustaining rate, pending the end of the Vietnam conflict.

The major objective of the Civil Defense program since 1961 has been the establishment of a comprehensive nation-wide shelter system to help protect our population from radiological fallout in the event of a nuclear attack. Most of this shelter is inherent in existing buildings but needs to be identified, marked and stocked with survival supplies before it can be considered truly useful. By the end of the current fiscal year we expect to have identified about 170 million spaces with a standard protection factor of 40 or more, of which about 101 million will have been marked and 55 million stocked with an average 14 days of supplies. Total shelter capacity should continue to grow in the future as a result of the continuing survey and design assistance efforts being conducted as part of the Civil Defense program. In total, we can probably expect an additional 55 million spaces from these sources over the next five years.

DEPLOYMENT OF AN ANTI-BALLISTIC-MISSILE SYSTEM: ISSUES—SELECTED ANNOTATED BIBLIOGRAPHY

(By Nancy T. Gamarrá, analyst in national security, Foreign Affairs Division, June 10, 1968, the Library of Congress Legislative Reference Service)

PERIODICALS AND SPEECHES

Address by Honorable Robert S. McNamara, Secretary of Defense, before United Press International Editors and Publishers, San Francisco, California, September 18, 1967. Department of Defense news release no. 868-67, Sept. 18, 1967. 25 p. Speech in which Secretary McNamara announced U.S. decision to deploy a thin ABM system and outlined reasons for this decision.

Ashworth, George W. Sea-missile key to U.S. defense? Christian Science Monitor, July 22, 1967: 11. Discusses the concept of a sea-borne ABM intercept system.

Baldwin, Hanson W. Military concern on lack of missile defense grows. New York Times, May 21, 1967: 1, 16. "The continuing development by the Soviet Union and Communist China of strategic missile systems is causing mounting concern among top military officers in the Pentagon."

Beecher, William. Soviet reported stressing multiple-warhead missile. New York Times, Sept. 10, 1967: 1, 18. It is reported that the Soviet Union is developing multiple warheads for its missiles that "could increase several-

fold its ability to hit a number of targets in the United States simultaneously."

Bird, David. Nuclear scientists disagree on missile defense. New York Times, Nov. 15, 1967: 24. Nuclear scientists disagree on whether an anti-ballistic missile system will halt or escalate arms race.

Bottomore, Edgar M. Mythology of the A.B.M. Commonweal, Oct. 20, 1967: 74-76. Author argues that deployment of an ABM system by the United States will not add to nation's security because it will result in further escalation of the arms race between the United States and the Soviet Union.

Brennan, D. G. New thoughts on missile defense. Bulletin of the atomic scientists, June 1967: 10-15. "... there are important possibilities in which BMD [Ballistic Missile Defense] could play a constructive role, possibilities that support the traditional arms control objective of mitigating the consequences of war if it occurs, without conflicting with the objectives of reducing the likelihood of war and reducing the burdens of the arms race. These possibilities have not been much discussed in the arms control community, quarters which have tended to be surprisingly hostile to any suggestion of deploying BMD."

Brown, Neville. Unreason in strategy. New Scientist, Oct. 1967: 746-747. "It can be shown that there is little evidence for the idea that national strategic and defense planning is governed by reason. Many recent defense undertakings, including anti-missile missiles, are based on ignorance and prejudice."

Bussey, Donald S. Deployment of the anti-ballistic missile (ABM): the pros and cons. Legislative Reference Service, Library of Congress, April 19, 1967. 43 p. Discusses ABM and the risk of nuclear war; ABM and damage limitation; and ABM and foreign policy.

Critics claim "thin" ABM not enough. Armed forces management, Oct. 1967: 21. The Joint Chiefs of Staff "is willing to accept the 'thin' nationwide deployment only if it is a first step toward providing protection to the 25 most heavily populated cities in this country."

Crosby, Col. H. Ashton. The case for anti-ballistic missiles. United States Naval Institute proceedings, July 1967: 2T-31. The author does not believe that the arguments which have been raised against deployment of an ABM system are valid and states his objections to these arguments.

Flinney, John W. X-ray missile to be key in defense against China. New York Times, Nov. 16, 1967: 1, 22. The Atomic Energy Commission is reported to be "making significant progress in developing a radically new nuclear X-ray warhead that would be a vital element in the Sentinel ballistic missile defense system being erected against Communist China."

Flinney, John W. G.O.P. group says "thin" missile net could split NATO. New York Times, Nov. 6, 1967: 1, 16. The U.S. decision to deploy an ABM system could rupture NATO and drive Europeans into position of "defensive neutrality."

FOBS, ABM and arms control. Survival, Jan 1968: 10-11. "At the root of much of the criticism of ballistic missile defence for the United States has been the fear of a new strategic arms race. The recent announcement of the probable Soviet development of a 'fractional orbital bombardment system' (FOBS) has increased this fear, and the ... article analyzes some of the arguments being used in the debate in the United States."

Frank, Lewis A. The ABM debate. Military review, May 1967: 45-52. "On balance, it would seem that the U.S. deployment of at least a light or anti-Chinese ABM system is justified by both the technical progress recently achieved in the design of such systems, by the need to know more about its performance utilizing the actual hardware, and by the necessity to provide active de-

fenses against the growing Soviet and the emergent Chinese nuclear threats to be expected within the coming decade."

Gilpatrick, Roswell L. The brink of another arms race? New York Times magazine, Jan. 15, 1967. Because of the Soviet offensive and defensive buildup the United States is faced with the possibility of a stepped-up arms race with the Soviet Union.

Johnston, Lt. Douglas M., Jr. ABM: the high cost of living. United States Naval Institute proceedings, Oct. 1967: 26-38. "Mankind's most basic, and most frequently threatened, right—the right to live—is menaced today as never before. A defensive system against enemy nuclear missiles will be enormously expensive and it will not bar our doors completely; but it will raise the price of admission."

Hamilton, Thomas J. U.S. says Nike net will spur atom pact. New York Times, Sept. 20, 1967: 1, 18. U.S. officials at the Geneva Disarmament Conference claim that the "decision to establish an anti-ballistic missile network against Chinese Communist attack should improve the prospects for the proposed treaty to prevent the spread of nuclear weapons."

Kleiman, Robert. MIRV and the offensive missile race. New York Times, Oct. 9, 1967: 46. "Pressure from Congress and the Joint Chiefs of Staff for a heavy antiballistic-missile (ABM) system oriented to defense against Soviet attack reflects an old military weakness: preparing to fight the last year."

Lall, Betty Goetz. Congress debates the ABM. Bulletin of the atomic scientists, Sept. 1967: 28-33. "On the ABM question ... the pattern of Congressional interest shows some usual and unusual aspects ... They (Congressmen) are pondering many of the consequences of a decision to deploy or not to deploy. There is no panic and little oratory. They do not pretend to have pat solutions to the problem and clearly most would like to be confronted with a case of successful diplomacy to avoid a commitment to deploy."

Lyons, Thomas C., Jr. Anti-missile defense systems. Editorial research reports, vol. 1, no. 7, Feb. 15, 1967: 123-139. Article discusses the following topics: Current Debate on Anti-Missile Systems; Development of the Missile Competition; and American Missiles and National Security.

Martin, Laurence W. Ballistic missile defense and Europe. Bulletin of the atomic scientists, May 1967: 42-46. "West Europeans have two interests in the prospects for ABM. Being deeply affected by the state of U.S.-U.S.S.R. relations, United States' allies have a direct interest in all the arguments concerning the wisdom of ABM from a strictly U.S. point of view ... As Europeans, however, they also perceive certain special implications for themselves."

The missile defense question: is LBJ right? a background report. Washington, D.C. Republican National Committee, Feb. 20, 1967. 55 p. "Great responsibilities rest on those who must make the decisions regarding our defense against a nuclear threat. It is in an effort to help these persons, by providing them with available information, that the material in this booklet has been assembled."

Missile defense: LBJ's bid to curb arms race gains support. Science March 31, 1967: 1651-1654. "... President Johnson's proposal that U.S. and Soviet negotiators seek an agreement to refrain from, or limit, deployment of antimissile missiles thus far has considerable bipartisan support on Capitol Hill."

Morris, John D. Senators call Nike plan a step to full defense. New York Times, Sept. 17, 1967: 2. "The Administration's decision to deploy a limited missile defense around the country was viewed by some Senators ... as the first step toward establishment of a full-scale system that would cost \$7-billion to \$15-billion."

Norman, Lloyd. Nike-X: big chip in the deadly gamble of nuclear exchange. Army, March 1967: 25-33. "... the shifting balance of nuclear killing power between the United States and the Soviet Union sets off a series of moves and countermoves in the ancient game of offense-versus-defense. The game is played on no simple checkerboard, but on one that resembles the tangled maze of wiring in an electronic game with its interplaying factors of psychology, military power, international politics, and national doctrines. . ."

Pay, Rex. U.S. ABM would imperil test ban treaty. Technology week, March 20, 1967: 14-15. "A decision by the United States to deploy an operational anti-ballistic missile (ABM) system would probably require the resumption of atmospheric nuclear testing by this country, according to some high-level weapons experts."

Rabinowitch, Eugene and Ruth Adams, eds. Debate the antiballistic missile. Chicago, Illinois, Bulletin of the atomic scientists, 1967. 172 p. (Collection of articles on ABM.) "The layman must respect the creative intelligence which went into the development of the ABM system; but this appreciation is entirely apart from the process and privilege of decisionmaking, which need not remain behind closed doors. The subject is one of the most important questions before this nation. ABM is an open-ended armament program, of incalculable importance for our future and for the future of the world."

Rodberg, Leonard S. ABM-some arms control issues. Bulletin of the atomic scientists, June 1967: 16-20. "The deployment of ABM systems will not only postpone the day when we can look elsewhere than to nuclear weapons for the key to national power, but it will also place greater emphasis upon the possibility of nuclear war, the role of nuclear weapons in providing a defense, and the value to a country of nuclear independence."

Schmidt, Dana Adams. Kosygin is cool to missiles curb. New York times, Feb. 10, 1967: 1, 6. Soviet Premier Kosygin is reported to have said that defensive ABM systems were less dangerous to mankind than offensive systems.

Strategic defense: what the ABM deployment means. Armed forces management, April 1968: 71-74. Outlines the reasons for the Defense Department's decision to deploy an ABM system and the limitations and drawbacks of ABM deployment.

Thurmond, Senator Strom. ABM: lessening the threat of nuclear blackmail. Data, Oct. 1967: 10-11. Argues that the United States "will not be as susceptible to nuclear blackmail or Soviet miscalculation" since the decision has been made to deploy a U.S. ABM system.

U.S. missile plans criticized in Bonn. New York Times, Oct. 28, 1967: 11. A West German official says that U.S. plans to deploy an ABM system would erode the Western Alliance.

Weisner, Jerome B. The case against an antiballistic missile system. Look, Nov. 28, 1967: 25-27. Author does not believe that a "really effective antimissile system is remotely possible for either the U.S. or the Russians."

Weisner, Jerome B. The cold war is dead, but the arms race rumbles on. Bulletin of the atomic scientists, June 1967: 6-9. "... If the ABM systems are built, there will certainly be further large increases in military expenditures for new and more sophisticated weapons as both sides jockey to maintain a credible deterrent to try to protect their citizens from the horrors of nuclear war."

Young, Elizabeth. ABM: no alternative to politics. Bulletin of the atomic scientists, June 1967: 47-49. "The only reason for U.S. deployment [of an ABM system] seems to be the fact that the Soviet government is deploying it—and the U.S. government cannot refuse to give their people a defense that

the Soviets have." But the author argues that sophisticated military power can no longer solve the world's disagreements.

Young, Oran R. Active defense and international order. Bulletin of the Atomic Scientists, May 1967: 35-42. Author "analyzes the consequences that would result from alternative patterns of ABM deployment."

CONGRESSIONAL DOCUMENTS

U.S. Congress. Joint Committee on Atomic Energy. Hearings: Scope, Magnitude and Implications of the United States Antiballistic Missile Program. 90th Congress, 1st session, 1967. 153 p. Hearings "review the plans and programs relating to our ABM program in the context of three recent developments": the Soviet offensive buildup, the Soviet defensive buildup, and the emergence of China as a nuclear power.

Testimony is given by Dr. John S. Foster, Jr., Director of Defense Research and Engineering; Alice Langley Hsieh, Rand Corp.; Dr. Philip E. Mosely, Professor of International Relations and Director of the European Institute, Columbia University; Paul H. Nitze, Deputy Secretary of Defense; and Thomas Wolfe, Rand Corp., and member of the Sino-Soviet Institute, George Washington University.

U.S. Congress. Senate. Committee on Appropriations. Subcommittee on Department of Defense; and Committee on Armed Services. Hearings on Military Authorizations and Defense Appropriations for Fiscal Year 1968. 90th Congress, 1st Session, 1967. Part I.

Testimony of Secretary of Defense McNamara, pp. 44-61; 231-241; 260-269. Testimony of Gen. Earle G. Wheeler, Chairman of Joint Chiefs of Staff, pp. 249-252.

U.S. Congress. Senate. Committee on Armed Services. Statement by Secretary of Defense Robert S. McNamara on the Fiscal Year 1969-73 Defense Program and 1969 Defense Budget. Prepared January 22, 1968, pp. 41-69, 74-75.

Statement of Defense Department policy with respect to the deployment of an ABM system.

EXHIBIT 3

STATEMENT OF DR. JOHN S. FOSTER, JR., DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

I am pleased to be here today. I understand that you have requested a discussion of the technical status of the U.S. ballistic missile defense program.

In discussing the general subject, let me first say that every system we have ever seriously considered for deployment involves the use of radars to detect and track the incoming targets, and the use of these same or different radars to guide ground-to-air interceptor missiles to the vicinity of the targets. There a command from the ground causes the interceptor warhead to detonate and destroy the target. It is clear that such a defense system does not provide a shield which makes a nation impervious to attack, since the interceptors can always be avoided or outnumbered—provided always that the enemy is willing to pay the price in decreased fatalities or increased cost to his offensive effort.

In reviewing the history of ballistic missile defense over the past 10 years, it seems there has always been controversy over its value or lack of value. Of course, if the defense had been a true shield, there would have been no controversy, and we would have made a deployment decision long ago.

The first controversy arose around the question, "Could a bullet hit a bullet?" This phase passed, first when calculations showed the feasibility of such an intercept and later and most definitely when successful intercepts of actual ICBM targets fired from Vandenberg Air Force Base were accomplished by the old Nike-Zeus system in 1962-63. We had 10 out of 14 successful intercepts.

After this "simple" problem was solved,

it was realized that the offense would replace the relatively easy-to-intercept single warhead with clouds of objects, or take other deceptive measures. Examples of these objects were decoys designed to look like warheads to the radar, and chaff designed to conceal the warhead in a cloud of light objects. Against those more sophisticated targets there was a necessity for the defense to discriminate among them so as to know which objects to take under fire. Hence many objects might have to be tracked and observed simultaneously. Also, it might be necessary for the defense to wait for atmospheric reentry of the targets and rely on slowdown and burnup of the lighter objects before this discrimination could be accomplished.

The old Nike-Zeus system, when confronted with these more sophisticated targets, had two fatal defects. One was that it used what are now considered to be old-fashioned mechanical radars, which had to be mechanically slewed or pointed at each target in turn—a matter of seconds. One practically had to have a radar for each target. And the Zeus missile could not be delayed in firing until atmospheric reentry of the targets took place, because it was too slow. Hence discrimination could not be aided by atmospheric filtering.

Because of these defects, the Nike X concept was born. First, the mechanical radars of Nike-Zeus were replaced by phased array radars, which by varying the electrical phase of the power over the face of a fixed antenna array could change the direction of the radar beam in a matter of microseconds. This imparted a capability of tracking many objects simultaneously, and thus removed one of the Zeus defects. Second, a very high-performance, short-range-interceptor missile, the Sprint, was introduced. It was smaller, cheaper, and had much higher acceleration than Zeus, and thus could afford to wait until reentry of the targets before being committed to fire. Atmospheric filtering was now feasible and the remaining targets could be attacked with the high firepower Sprints.

The old Zeus interceptor was retained in the system for long-range attacks on simple targets. We now had two interceptors—the Zeus and the Sprint.

The Nike X development, initiated in 1963, was thus much more effective than the old Zeus system. It must be noted, however, that it was essentially a "terminal defense" system. The Sprint could only defend cities or selected sites. Hence, since it is obviously impractical to deploy terminal defenses at every small city or village in the United States, it was subject to bypass attack. An enemy could always target the undefended cities and obtain high casualties. This option was available even to unsophisticated opponents. The sophisticated opponent, by concentrating his firepower, could overwhelm the defense at any selected defended site. The value of ballistic missile defense was therefore questioned.

The next important development in defense effectiveness came with the introduction of "area defense" in the period 1964-65. I would like to define the term "area defense."

The detection sensor is the perimeter acquisition radar (PAR) which detects ballistic missiles at long ranges. The PAR radar tracks the incoming missile and predicts its future path. To intercept the incoming missile, we employ the Spartan missile which is a long-range interceptor developed from the old Nike-Zeus. Once the PAR radar has predicted the future path of the missile a Spartan missile is fired so as to intercept it. This interceptor intercepts the incoming missile well above the atmosphere. Because of its long range the Spartan can intercept incoming missiles directed at targets several hundred miles from the Spartan battery location. The Spartan missile is guided by a missile site radar (MSR) which is associated with each battery.

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With the introduction of Spartan, the Zeus interceptor was no longer required—in effect, the Spartan replaced the Zeus.

Comparatively few Spartan batteries can defend the whole United States from simple attacks.

You will note I said "simple attacks." It is still possible for a sophisticated opponent to confuse the defense and make the firepower demands on Spartan too high. In this case, terminal defense Sprints must be relied upon if we are to furnish a defense. The Spartan thus functions in two ways. It can provide a very effective defense over extended areas against simple threats. Against not so simple threats, it provides a defense in depth and is complementary to Sprint. In any case it forces the enemy, if he wishes to penetrate, to pay the price demanded by a sophisticated penetration aids program.

You will note that I have described a flexible set of building blocks consisting of PAR and MSR radars and two types of interceptor missiles, Spartan and Sprint. We also have a very large, sophisticated radar called TACMAR, designed specifically against sophisticated attacks. They can be put together in various ways to provide varying levels of defense against different threats.

For example, if we wished to defend the United States against a large Soviet attack, we would provide an overlay of an area defense such as I have described. As I mentioned earlier, however, it would be necessary to depend primarily on terminal Sprint defense, including TACMARs, at selected cities. A selected city defense (including the area component) would cost about \$10 or \$20 billion depending on the number of cities defended.

As a matter of technical judgment, I believe that these larger deployments carry with them technical risks. The likelihood of large and sophisticated attacks with the deployment of significant U.S. defenses increases the technical uncertainty of the defensive system. Even with an ABM deployment we would have to expect that in an all-out exchange, dozens of their warheads would likely explode in our cities.

Mr. JAVITS. Mr. President, will the Senator yield?

Mr. COOPER. I yield.

Mr. JAVITS. I congratulate the Senator for his remarks today, for the following reasons: First, he is not accepting as sacrosanct a decision which has been taken by alleged authorities in the executive branch. One of the most significant developments in recent months here in the Senate, in my judgment is that we are no longer willing to accept blindly even what the Senate Committee on Armed Services brings in with respect to fundamental issues of national security. This is a big step forward. There is too much involved, in peace, security, and competing financial considerations, to justify any continuance of what was almost a tradition of accepting anything proposed by the administration and approved by the Armed Services Committee.

Second, the Senator is taking nothing for granted. It appears to many of us that the "thin" ABM was agreed to give partial satisfaction to those power elements of the Military Establishment—and their champions in Congress and elsewhere—who wanted a full scale heavy ABM system directed against the U.S.S.R.

Next, he challenges some of the intelligence assumptions upon which all of this is based. As the Senator has said, our intelligence experts have changed

some of their own earlier estimates. He points out the danger of being leap-frogged technologically on an important and costly security system which, once launched, we might have to continue for a long time, without being able to change direction or take full advantage of subsequent technological breakthroughs.

It was well for our colleague to have dealt with this subject as thoughtfully as he has today. I shall study his suggestions concerning appropriations cuts on deployment items with a view to seeing whether I can join with him in his proposed amendments. I appreciate his having laid it out to stimulate my thinking and, I hope, the thinking of other Senators.

Mr. COOPER. I thank the Senator. It was my purpose to present my views that I arrived at on the basis of the study I have been able to make. I know the intellectual powers and the judgment with which the Senator from New York will study this matter. Whatever conclusion he comes to I know will be based on judgment, reason, and facts, and not just on emotional feelings, as strongly as they appeal to all of us to want to do everything possible to protect the security of the United States. The question is, Will it protect the security of the United States?

The more I have read the testimony of those who have testified in favor of the system, the more I found that there are so many contradictions. All the proponents admit that the installation of the system will lead to a greater pressure to produce more defensive weapons which can cope with any system which could be installed.

Mr. JAVITS. I thank the Senator.

Mr. CASE. Mr. President, will the Senator yield?

Mr. COOPER. I yield.

Mr. CASE. I, too, commend the Senator and, in my case, join with him at least as far as he has reached his own determination in opposition to the antiballistic missile system, both the large system which is not being immediately projected and the so-called thin system.

It seems to me the Senator has pointed out many things that needed to be said, and he has correctly posed the issue as this: Will what is proposed add to or lessen the security of the United States? Will it increase or decrease the possible destruction of human life?

In this connection I would put to the Senator a specific argument by, I think, the chairman of the Joint Chiefs of Staff in some testimony I have read or heard, to the general effect that an antiballistic missile system might save the lives of some 30 million to 60 million Americans, and would it not be worth putting into effect for that reason, even if hundreds of millions of people were killed? This is not a precise statement of the argument, but it is the substance of it.

There is, I know, in the Senator's mind, a very specific answer to this argument. He has answered it already, in fact, in the way he has made his statement, but I wonder if he would comment on that specific point.

Mr. COOPER. I did not discuss in detail, in the limited time I had, every

phase of the system and the arguments for it and the arguments against it. For that reason, I had said I would place in the RECORD the testimony of former Secretary McNamara on this subject. It is not too long. It gives very concisely the facts as far as we understand them on the question which the Senator has raised. It is one which we have discussed, and one which has bothered me and to which I have given much thought.

I think the testimony is clear that the installation of a heavy ABM system to try to meet a Soviet attack would do little to save human life, because, if the Soviet Union made a first strike, with or without an ABM system, millions and millions of our people would be destroyed.

I do not think it would have any effect at all upon the ABM system.

There is, however, a table in this testimony which deals with estimated U.S. fatalities from a possible Chinese first strike. It is stated that if seven or eight Chinese intercontinental ballistic missiles were launched against the United States, without a Sentinel system, 15 million American lives would be lost; and that with the Sentinel system, the loss of life might be held down to 1 million. That is, in my view, the strongest argument and the only argument for the installation of this system.

But against that, there is certainly some elementary reasoning. By 1974 or 1975, when the Chinese might be able to fire seven or eight intercontinental ballistic missiles at the United States, knowing that the United States has today 1,710 missiles and, of course, will be producing more; and realizing the effectiveness of those missiles, which number will be tripled or, perhaps multiplied by 10, when MIRV is introduced.

I do not know how irresponsible we think the Chinese are; but it would be hard for me to believe that they would fire 10 missiles at the United States, knowing they would as a result be literally wiped off the face of the earth.

Then, if we have installed this ABM system, and the Soviet Union begins to worry about our installation of the system, it would, in turn, of course, install one. We would then respond and install a heavier one, and nothing would be accomplished as far as our protection against the Soviet Union or their protection against us is concerned, except a multiplication of arms.

Mr. CASE. And the point, of course, as the Senator has just pointed out, is that the risk of the loss of life will be much greater, in total, because we will not be dealing with a static situation, one which we can keep within our control, which will stop developing when we build our light system.

Therefore, it is not only a question of possibly saving 15 million American lives, or whatever the number from a Chinese first strike, but of the danger to 200 million Americans and hundreds of millions of others in other countries, which will be so much greater from the accelerated development in numbers and types of missiles all over the world, and particularly vis-a-vis the Soviet Union.

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Mr. COOPER. I think so. There again, I refer to Secretary McNamara, who was speaking to the committee upon the basis of hard intelligence.

He admitted that after this so-called thin system is installed, one which he believed would be sufficient or effective in the middle 1970's, then the Chinese could improve their intercontinental ballistic missiles, and then the United States would have to extend its thin system and make it a heavier system even to keep up with the growing destructive capabilities of the Chinese. Of course, that would inexorably move into the complete system which it is said by some would protect us against a Soviet attack.

Mr. CASE. One further question, if the Senator will yield.

Mr. COOPER. Yes.

Mr. CASE. Is it not the Senator's understanding, as it is mine, that the top scientific advisers to the executive department for the last several administrations have unanimously agreed in advising against the deployment of either a full or a light antiballistic missile system?

Mr. COOPER. I have been so informed, and I have heard at least one of those advisers say that all those who had been the principal scientific advisers of President Eisenhower, President Kennedy, and President Johnson had advised against taking this step of deploying an antiballistic missile system. I am sure that is the Senator's information also.

Mr. CASE. That has been my experience also. In fact, two of them have spoken to me in those terms.

I thank the Senator from Kentucky. I commend him for his statement, and wholeheartedly join him in it.

Mr. COOPER. Mr. President, I yield the floor.

Mr. THURMOND. Mr. President, during the past few days we have been hearing an increasing number of rumors about the methods that would be employed by the President to effect a \$6 billion reduction in the fiscal year 1969 budget. This reduction is the required trade off that the Congress imposed last month in return for enacting legislation to authorize a 10-percent surtax.

Recently, I heard from a good authority that there is an unannounced administrative policy decision to take the bulk of the \$6 billion cut out of expenditures for defense. Moreover, it is well known that military authorities in the Pentagon are now reviewing their requirements in an effort to reduce the budget. In this regard, it has come to my attention that large hardware items are particularly vulnerable for reduction, and that the Army's Sentinel project—the "thin" ABM defense—is a certain target.

In that connection, today's issue of the Washington Post carries a column by Evans and Novak entitled "ABM Project Due To Bear Brunt of Cuts, Sparing Great Society." We are all familiar with the administration's policy of "leaking" news on controversial subjects to the newspapers as trial balloons to sample public opinion. This is an apparent case, and I think that it is important to flush the issue out of the conjecture stage and into the open for a clear scrutiny.

I ask unanimous consent to have printed in the Record the article entitled "ABM Project Due To Bear Brunt of Cuts, Sparing Great Society," written by Rowland Evans and Robert Novak, and published in the Washington Post of June 13, 1968.

There being no objection, the article was ordered to be printed in the Record, as follows:

ABM PROJECT DUE TO BEAR BRUNT OF CUTS, SPARING GREAT SOCIETY

(By Rowland Evans and Robert Novak)

A still undisclosed scheme to eliminate all new money for the embryonic anti-ballistic missile (ABM) system is the first dramatic step of President Johnson's grand strategy for complying with congressional economy strictures without cutting into Great Society spending.

The opening wedge of that strategy is an amendment to the Defense Appropriations bill that Sen. Philip A. Hart of Michigan plans to offer, eliminating the entire \$1.2-billion appropriation for the ABM Sentinel project. That would result in an estimated half-billion-dollar cut in spending for the new fiscal year (starting July 1).

What makes this a significant move in the tortuous game of budget-cutting between Congress and the White House is the origin of the ABM ripper amendment. It was scarcely Phil Hart's own idea. Rather, the White House asked Hart, a dependable Administration wheelhorse, to put in the amendment when the defense money bill reaches the Senate floor in late June.

Moreover, the President's effective postponement of the Sentinel ABM program is but one part of his undeclared policy to take the bulk of the 6-billion reduction in expenditures out of defense. Because of this decision, word has been passing in the highest levels of the Administration that Great Society and other social welfare programs will not be further reduced to make up the \$6 billion.

From the moment that Mr. Johnson announced on June 1 that he would most reluctantly accept the congressional mandate for \$6 billion in spending cuts to get \$10 billion in higher taxes, his top budgetary experts have been looking around for ways to insulate the Great Society. Examining and discarding numerous gimmicks to circumvent the congressional edict, they glumly decided that the congressional order to cut \$6 billion was ironclad.

From that conclusion flowed the unannounced policy decision to cut into an already pared-down Pentagon budget to satisfy congressional demands.

Of the \$4 billion in spending reductions that the President originally insisted would be the maximum he would accept, \$2 billion was to have come out of the Pentagon—a figure, it was then said, that could go no higher. Now, however, the defense cut will be at least \$3 billion and possibly more. The rest of the spending cut will come out of foreign aid, space, and other non-social welfare items, according to present plans.

Consequently, Pentagon staffers have been working overtime in recent days to find additional sources for reducing their budget. There are not many. For instance, a further reduction of U.S. troops in Europe, while winning hurrahs on Capitol Hill, wouldn't make much impact on the current spending budget.

That leaves big hardware items: the manned orbiting laboratory and, more important, the Sentinel project, which always has had more than its share of enemies inside the Pentagon. But Mr. Johnson did not wait for the Pentagon's considered judgment. Instead, he decided on the Hart ploy.

Hart tried to keep his proposal a secret, at least until the Senate Appropriations Committee finished work on the defense

money bill—perhaps today. Whether he then planned to surface it overtly as a White House proposal or to disguise it as his own, is not known.

In any event, Hart and the White House have one hard argument on their side: The Chinese intercontinental missile, which the Sentinel is supposed to guard against, is now some nine months overdue.

Furthermore, all the elements of political gamesmanship will be on Mr. Johnson's side. He will be asking the economy-minded Congress to cut an item put into the budget partly because of pressure from conservatives in the House. If Congress refused, he could still impound the funds and point to congressional refusal to cut spending when it really counted.

Nor is there must of a popular constituency today lobbying for anti-missile systems, whatever their importance to the country's survival may be. The pressure, rather, is for no further cuts in Great Society spending, and that is what Mr. Johnson also is bent on avoiding.

Mr. THURMOND. Mr. President, my colleagues will note that the Evans and Novak article predicts that an amendment eliminating the entire \$1.2 billion for the Sentinel antiballistic missile project will be introduced. Today the distinguished Senator from Kentucky has stated that he expected to offer such an amendment. I have also heard it rumored that the distinguished Senator from Michigan [Mr. Hart] might offer such an amendment. This possibility reminds me of Senate action taken on April 18 when S. 3293—appropriations for procurement of missiles, aircraft, naval vessels, tracked combat vehicles, and research and development—was acted upon. My colleagues will remember two separate attempts to block work on the Sentinel system.

The first attempt was an amendment to drop \$342.7 million for the Sentinel from the Army's procurement funds. This was rejected by a 17-to-41 rollcall vote. The second attempt was an amendment to prohibit deployment of an ABM system until the Secretary of Defense certified that it was practicable and that its cost was known with reasonable accuracy. This amendment was defeated by a very close vote of 28 to 31.

It is apparent from the action of last April, that many of my colleagues were, at that time, ready to delay the deployment of the Sentinel system sacrificing the prompt installation of this sorely needed vital defense system on the altar of economy. In my opinion, the climate of protest now so evident in the Nation's Capital might serve to influence even more Senators to vote against the ABM when the defense appropriations bill comes up for approval. In an effort to emphasize the importance of the Sentinel system, and to forestall any precipitous action that might result in an impetuous wave of economy, I should like to discuss the need for ABM defense of this country in some detail.

The U.S. ABM system has been under development for more than 10 years. It was only through the pressure of the Congress that the administration finally dropped the foot-dragging policy that had caused delay after delay in the authorization of the deployment of the antiballistic missile defense system. Senators will recall this long and tortuous fight from the following summary:

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Mid-1950's. Each year Congress provided funds for ABM research and development. By 1967, a total of \$2.8 billion had been spent on Nike-Zeus and Nike-X.

1963. In the first secret session of the Senate since World War II, Senators were briefed on our strategic posture and were warned that the Soviets had a prototype ABM system. The Senate Armed Services Committee added an amendment to the annual procurement bill, authorizing appropriation of \$196 million to begin procurement of ABM parts. At the instigation of the administration, this amendment was struck on a rollcall vote—58 to 16.

1966. At the insistence of the Senate Armed Services Committee, Congress approved \$167.9 million for ABM procurement. Secretary McNamara had not asked for these funds and did not use them.

November 10, 1966. McNamara announced that the Soviets had begun deployment of an ABM system around Moscow.

January 1967. President Johnson stated that no deployment of a U.S. ABM system would be made until completion of the arms control negotiations with Russia. Secretary McNamara's military posture report to the Congress contained a lengthy argument against deployment of a complete, Russian-oriented ABM system. He stated that it would be wasteful and ineffective, and it would disturb the strategic balance. Two days later, Gen. Earle Wheeler, Chairman of the Joint Chiefs of Staff, disagreed with the Secretary of Defense, and recommended "a measure of defense" for the country.

1967. Congress approved the following amounts for the fiscal year 1968 military budget:

	[In millions]	
ABM procurement	-----	\$297.6
ABM R and D	-----	421.3
ABM construction	-----	64.0

June 17, 1967. Red China detonated its first hydrogen bomb. Public pressure for immediate installation of ABM defense mounted.

September 18, 1967. Secretary McNamara announced the decision to deploy a "thin" ABM defense system—the Sentinel—oriented against the Communist Chinese threat that would exist by the mid-1970's. He justified this step on the grounds that the Chinese might "miscalculate," but failed to admit that the most dangerous threat to our security would be a similar miscalculation by the Soviet Union.

At this point, Mr. President, I should like to document the history of ABM development by placing in the RECORD a speech given by Dr. Finn Larsen, Principal Deputy Director, Defense Research and Engineering, Department of Defense, at Millsaps College, Jackson, Miss., on January 10, 1968. I ask unanimous consent that this address, entitled "The Deployment of Nike Sentinel," be printed at this point in the RECORD.

There being no objection, the address was ordered to be printed in the RECORD, as follows:

THE DEPLOYMENT OF NIKE-SENTINEL (Address by Dr. Finn Larsen)

On September 18 the Secretary of Defense announced that a decision had been made to deploy throughout the United States an Anti-Ballistic Missile System. In light of the interest that this decision has engendered I welcome the opportunity to speak to you on this subject.

The original need to provide a defense against ballistic missiles came in the 1940's with the introduction of the German V-2 short-range ballistic rocket, and the experience subsequent to World War II with this class of weapon confirmed the importance of a defense. By the middle 50's the potential threat to the United States had become serious because of the extension of missile ranges to intercontinental distances. The threat presented by the ICBM is unique because of the ICBM's speed and thermonuclear warhead. Traveling at four miles a second, an ICBM can reach this country in 30 minutes compared to the hours previously required by enemy bombers. For almost a decade the ICBM was considered by many to be a weapon against which defense was impossible.

Every ABM system we have ever seriously considered for deployment involves the use of radars to detect and track the incoming targets, and the use of these same or different radars to guide ground-to-air interceptor missiles in the vicinity of the targets. At the point of nearest approach to the ICBM, a command from the ground causes the intercepting warhead to detonate and destroy the target. It is clear that such a defense system does not provide a shield which makes a nation impervious to attack, since the interceptors can many times be outnumbered—provided always that the enemy is willing to pay the price of decreased fatalities or increased cost to his offensive effort.

In reviewing the history of ballistic missile defense over the past ten years, it seems there has always been controversy over its value or lack of that value. Of course, if the anti-missile defense had been an invulnerable shield, there would have been no controversy, and we would have made a deployment decision long ago.

The first controversy arose around the question "could a bullet hit a bullet?" This phrase passed, first when calculations showed the feasibility of such an intercept and later and most definitely when successful intercepts of actual ICBM targets fired from Vandenberg AFB were accomplished by the old Nike Zeus system in 1962-63. We had 10 out of 14 successful intercepts.

About the time this "simple" problem was solved, it was realized that the offense would replace the relatively easy-to-intercept single warhead with clouds of objects, or take other deceptive measures. Examples of these objects were decoys designed to look like warheads to the radar, and chaff designed to conceal the warhead in a cloud of radar-reflecting objects. Against these more sophisticated targets it was necessary to discriminate among them to know which objects were incoming warheads. Therefore many objects had to be tracked and observed simultaneously. If high altitude discrimination was unsuccessful, it was necessary for the defense to wait for the targets to reenter the atmosphere and to rely on slow-down or burn-up of the lighter objects before the discrimination could be accomplished.

The old Nike-Zeus system, when confronted with these more sophisticated targets, had two major defects. One was that it used, what are now considered to be old-fashioned, mechanical radars, which had to be mechanically slewed or pointed at each target in turn—a matter of seconds. A radar for each target was almost a necessity. The second defect was that the Zeus missile

launching could not be delayed until atmospheric reentry of the targets took place, because it accelerated too slowly to possibly reach its incoming target in time. Hence discrimination could not be aided by atmospheric filtering.

At about the time these defects were recognized, three developments were reaching the point where their application might overcome shortcomings in the Zeus system. First, by the early 1960's phased array radar technology, with its instantaneous electronic beam steering, was demonstrating that it could overcome the low traffic handling capacity of the mechanically slewed radars. One radar could now track hundreds of objects in space simultaneously. Second, new, large computers provided vastly improved data processing technology which enable an ABM system to handle the increased information provided by the improved radars. And, lastly, a small, very high acceleration missile was conceived which, because of its speed, need not be launched until enemy objects had penetrated the atmosphere and the atmosphere had filtered the heavy objects, like warheads, from the lighter objects such as decoys, chaff, etc. This new missile was named SPRINT, and the new concept was called Nike-X. In January of 1963 the Secretary of Defense directed the Army to pursue Nike-X as its highest priority development effort.

In spite of these quite significant developments, it was not yet time to deploy an ABM system, for at best what we had was a terminal defense, one which could only defend the city or installation near which it was deployed. It was not until the introduction of a long range missile called Spartan that an area defense became possible. With a high yield warhead and the ability to reach hundreds of miles into space, Spartan missiles may be deployed at relatively few (15-20) locations in the United States and still protect the entire country. With the addition of the Spartan, we had all the ingredients necessary to assemble an effective defense against a limited ballistic missile threat: PARs (Perimeter Acquisition Radars) to provide long range acquisition and tracking of the threat cloud and perform simple discrimination functions; MSRs (Missile Site Radars) to track targets, track and guide defensive missiles, and provide limited surveillance and discrimination; long range Spartan missiles to attack the threat cloud outside the atmosphere; short range Sprint missiles to attack the enemy warhead within the atmosphere; and the data processing technology required to tie the hardware together into an effective system.

I stated that these ingredients could provide a defense against a "limited ballistic missile threat." This phrase needs explanation. To explain requires that we examine our offensive capability, for the military planner must consider the offensive and defensive capabilities together. An increase or decrease in one invariably permits or requires a variation in the other, the sum of which may result in a reaction from a potential enemy such that the threat picture changes—and the planner must start over again.

The cornerstone of our strategic policy is to deter deliberate nuclear attack upon the United States, or its allies, by maintaining a highly reliable ability to inflict an unacceptable degree of damage upon an aggressor, or combination of aggressors, at any time during the course of a strategic nuclear exchange—even after absorbing a surprise first strike.

We call this our "assured destruction capability," and it will remain such as long as we maintain both the equipment (missiles, bombers, submarines, etc.) and the will to use it. This latter, of course, determines the

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credibility of our assured destruction without which we become a strategic "paper tiger."

Let us take a look at our strategic posture vis-a-vis that of the second most powerful nation on the earth today, the Soviet Union. Our forces are immense: 1000 Minuteman missiles; 656 missile launchers carried aboard Polaris submarines; and about 600 long-range bombers, approximately 40% of which are always on alert. Our alert forces alone carry more than 2200 weapons, averaging more than one megaton each, and only 400 one-megaton weapons are sufficient to destroy over one-third of the population of the Soviet Union and one-half her industry. These forces are more than those required to absorb a surprise attack by the Soviet Union and still inflict damage on the Soviet Union such that she is no longer viable in any meaningful twentieth-century sense. That ability is called "second strike" capability.

What are the relative Soviet situations? They are in essentially the same position. Although we have a substantial nuclear superiority over the Soviet Union, by a factor of about four to one, they also possess a "second strike" capability for precisely the same reason that we possess one. The result is that neither the Soviet Union nor the United States can attack the other without being destroyed in retaliation. Surely, this is the strongest possible motive for each to avoid a nuclear war.

What then might be the effect on this "balance" of deploying an ABM system by either protagonist? At current prices and with today's state-of-the-art, it costs approximately the same in money and other resources for the offense to re-establish the balance as it costs the defender to install his ABM system. Either can do this by one of several means: increase the number of bombers and missiles, provide them with penetration aids, increase the hardness of ICBM silos, disperse the silos, or improve the mobility of nuclear forces, to cite but a few. The net result would be that both protagonists would spend a great deal of money without improving their relative positions. In this fashion the Soviet Union and the United States influence one another's strategic plans. It is this action-reaction phenomenon that can initiate an arms race.

Were it technically feasible to develop an impenetrable ABM system, the foregoing would no longer be true; but the inescapable fact is that no ABM system in the foreseeable future will prove 100% effective against a determined, sophisticated attack. For these reasons this nation has decided against deploying an ABM system to counter the Soviet nuclear threat. We have chosen, rather, to propose a strategic arms-limitation agreement. I am sure you will agree that both nations—the world, in fact—would benefit from such agreement, first to limit, then reduce, strategic nuclear forces. I think we may be confident that, if agreement is not possible, both the United States and the Soviet Union, will maintain their assured destruction capabilities.

We have, however, announced a decision to deploy an ABM system and, at the same time stated that we cannot protect our cities from a Soviet ballistic missile attack. What is the purpose of our light ABM system called Sentinel? The primary objective is that of achieving protection against nuclear capability of Communist China. China detonated a nuclear device in October 1964 and has since detonated six more. We have evidence that they are devoting substantial resources to the development of missile delivery systems. It is likely they will have an initial ICBM capability in the early 1970's and a modest force in being in the mid-1970's. These weapons will be crude, similar to our first ICBM's.

Further, the Chinese-oriented ABM deployment would enable us to add—as a concurrent benefit—a further defense of our

Minuteman sites against Soviet attack, which means that at modest cost we would in fact be adding even greater effectiveness to our offensive missile force and avoiding a much more costly expansion of that force.

We cannot be sure why the Red Chinese wish to develop an ICBM system but the development may be for two reasons: the international prestige that goes with the possession of a nuclear capability and, more importantly to provide a basis for threatening her neighbors. Of course, this is only conjecture since, although we have some ability to monitor China's development effort from the technological point of view, it is impossible for us to determine the intent behind their effort. The Communist Chinese effort has been followed for several years and we waited as long as was prudent before deciding to deploy our Sentinel system. The determining factors were the lead times involved. We estimated as accurately as possible the date the Chinese would have an operational ICBM, and then backed off from that date the time it would take to have our Sentinel system in operation. By placing Sentinel in production early this year, the operational dates will coincide.

You may wonder why we deploy an ABM system to counter the Red Chinese threat when we discarded it as a rational course of action with respect to the Soviet Union. The answer is that only the passage of time will provide us with proof of Chinese intent, and military planners must be conservative, and secondly, we can provide an effective defense against any Chinese attack possible in the 1970's.

The United States now possesses and will continue to possess for as far as we can see into the future an overwhelming strategic superiority over Communist China, and the Chinese know that fact. However, it is conceivable that Chinese leaders at some future time might risk destruction by attempting nuclear blackmail against the United States in order to gain concessions, perhaps in Southeast Asia. If we had no defense, they might gamble that we would never accept the destruction of one of our cities in exchange for concessions so far removed geographically.

Although we know that the Chinese Communist leaders understand the devastation which the use of nuclear weapons by China could bring home to the Chinese mainland, we have no reason to believe that they will be any less cautious than the leaders of other nations with nuclear weapons, hostile action by Red China is not totally inconceivable. We can deploy, for a cost we can well afford (approximately 5 billion dollars), an ABM system which, against the Chinese threat, will remain effective with foreseeable improvements at least until the 1980's. We have decided to deploy that system.

Moreover there are other benefits to be derived from the deployment of Sentinel. By deterring Communist China from nuclear blackmail, we hope to discourage nuclear weapon proliferation among the present non-nuclear nations of Asia. A second benefit I have already mentioned—the option of providing additional protection of our Minuteman sites, even against a Soviet attack, which will improve our assured destruction capability. And, lastly, Sentinel is reliable enough to add protection for our population in the unlikely event of an accidental launch of an ICBM by any power.

The deployment of a system such as Sentinel can lead to mistaken attitudes about our military posture. One possible attitude is an inclination to treat Sentinel as a cure for all our military problems. This should certainly not be the case. Sentinel provides a defense against a narrow portion of a very broad threat spectrum, and then only in a unique set of circumstances. It is a strategic nuclear weapon and, by no means, can Sentinel serve as a substitute for

conventional forces to deal with the far more likely type of threat to the security of the free world. In cautioning against this danger last fall when he announced the decision to deploy Sentinel, Secretary McNamara noted that "The so-called heavy ABM shield—at the present state of technology—would in effect be no adequate shield at all against a Soviet attack, but rather a strong inducement for the Soviets to vastly increase their own offensive forces. That... would make it necessary for us to respond in turn—and so the arms race would rush hopelessly on to no sensible purpose on either side."

A second potential danger stems from the possibility of forgetting the purpose for which Sentinel has been designed: to counter an emerging Communist Chinese threat. It will be quite easy to fall into this trap with a system such as Sentinel because it consists of a flexible set of building blocks—the two types of radars and two types of interceptor missiles—which can be assembled in various combinations and numbers of provide varying levels of defense against different related threats. Now that we have a system that will work, there will be pressure to expand Sentinel, by adding more and more radars and missiles, into a heavy Soviet-oriented ABM system.

This we must not do. I remind you of the action-reaction phenomenon. It can only result in a great deal of expenditure by both the United States and the Soviet Union with, in the final analysis, no improvement in the relative strategic position of either.

There is a third dangerous concept which is of particular interest to me in my position as Deputy Director for Defense, Research and Engineering and that is the danger of thinking that we can allow a relaxation in research and development in the broad field of defense against ballistic missiles because we are about to deploy an operational system. To date this nation has spent approximately four billion dollars on ABM Research and Development. Our current level of effort runs to approximately one-half billion dollars a year in R & D alone. We intend to maintain this level of effort. We cannot afford the luxury of imagining that we have reached some sort of ABM technological plateau. We cannot afford to become complacent—I believe we will never develop an impenetrable ABM shield regardless of the sophistication of the attack and the dedication of the attacker; or, and vitally important, until we can reach an enforceable agreement with the rest of the community of nations to outlaw nuclear weapons entirely.

I have talked about the history of ballistic missile defense and the rationale behind the decision to deploy Sentinel. I would like to address a few points frequently raised by the detractors, the people who feel we should not deploy the Sentinel. Their reasons are numerous, for example some believe that the system is either too expensive in terms of the benefit to be derived; others that the interceptor warheads exploding overhead will cause casualties; still others, that the system is provocative to the Russians, for example.

One question frequently asked is: "How do you know if the system will work, since there's no way to test it without violating the ban on atmospheric nuclear testing?" The warheads for both the Spartan and Sprint missiles can be tested quite adequately underground. It is not necessary that they be tested in or above the atmosphere. The remainder of the system will be tested at Kwajalein Atoll in the Pacific where sites are under construction and where we have been conducting similar missile and radar tests for research and development purposes for some years.

The claim has been made that our own population will suffer casualties from the Spartan and Sprint warheads detonated overhead. There are three effects to consider: Flash, blast and radioactivity. When the war-

head explodes there will be a bright flash of light. Most of the population underneath would scarcely notice it. If anyone were looking in that part of the sky, there is a possibility that the flash could temporarily blind him, but there would be no serious after-effects.

Because the high yield bursts take place above the atmosphere, there would be little or no blast. The effect would be like a sonic boom.

There would be no significant fallout from the radiation emitted at the time of the explosion. If dozens of defensive bursts occurred, they would deposit radioactivity in the atmosphere. There would be no harmful short term effect and the long term effect would be negligible—very similar to that experienced from our test series in 1962.

Although the Sprint warhead would explode in atmosphere, it would not cause ground damage because of its low yield.

Another point that arises from time to time is whether we really expect the Soviets to believe that the Sentinel system is not aimed at them, and if they do not believe it, is it not an escalatory move on our part? Frankly this is difficult to assess. We have no positive assurance that they believe the system is designed to protect us against Chinese missiles. We hope that they believe us and we are counting on their sophisticated knowledge and their years of experience in the field. It should be quite obvious to the Soviets from the technical design of the system and the deployment plans that will be made public that the system is Communist Chinese-oriented and not Soviet-oriented.

A question that may have been raised in your minds is: "If Red China continues to progress at her current rate in strategic weaponry, how effective will Sentinel be in the 1980's and later?" First, let me say that we will have maintained our superiority through that or any time period. Nevertheless, the point is a good one because the technical gap will have narrowed. As the Chinese Communists improve their technology and increase their forces in number, we may expect them to have developed their own "second strike" capability; and the dangerous period of possible irrationality will have passed. The result then may be a U.S.-Chinese impasse similar to that existing today between ourselves and the Soviet Union.

In closing, I would like to make two significant points. First is that we in the Department of Defense earnestly believe that an enforceable strategic arms-limitation agreement is a desirable first step toward the eventual abolition of nuclear weapons. To quote Secretary McNamara: "What the world requires in its 22d year of the Atomic Age is not a new race toward armament."

"What the world requires in its 22d year of the Atomic Age is a new race toward reasonableness."

Secondly, the decision to deploy the Communist Chinese-oriented Sentinel system is not another lap in the race toward armament, but rather a protective umbrella which enables us to get on with the race toward reasonableness.

Mr. THURMOND. Mr. President, while Doctor Larsen's historical account of the development of the Sentinel system is very good, I am not in agreement with some of his philosophy concerning Soviet and Red Chinese reactions to its installation.

An excellent refutation of the philosophy that antimissile systems spur the arms race appeared in a feature article of the November 1967 issue of Air Force magazine. The article entitled "The Case for the Defense," was written by Mr. J. S. Butz, technical editor of Air Force. He pointed out that, whether we like it or not, both offensive and defensive tech-

nologies are advancing. Mr. Butz warned that we should not be trapped in an "all-offense" posture and that the path to security required a technologically advanced, balanced offensive-defensive posture.

Mr. President, I ask unanimous consent that the article be printed at this point in the RECORD.

There being no objection, the article was ordered to be printed in the RECORD, as follows:

THE CASE FOR THE DEFENSE

(By J. S. Butz, Jr.)

The proposal by Secretary of Defense Robert S. McNamara that the U.S. produce and deploy a so-called "thin" antiballistic missile (ABM) defense system has provoked a crossfire of pro and anti arguments. Very little of the discussion has succeeded in hitting the real target, which is the proper relationship between strategic offensive and defensive capabilities in a U.S. strategy that aims at deterring all-out nuclear war under conditions favorable to U.S. interests.

No military problem has ever captured the attention of the United States—and the world—as has the problem of defending against nuclear missiles. The Vietnamese War has been a strong diversion, but there is much evidence that more people are concerned about the consequences of nuclear war than about any other problem mankind has ever faced.

Sadly, the potential threat is far better understood than are the alternatives, either for removing the threat or for living with it. Part of the problem is that nuclear strategy discussions tend to become complicated. Partly this is due, in Mr. McNamara's words, to the "psychologically unpleasant" aspect of the problem. People simply don't like to think about the "unthinkable." But mostly the lack of understanding stems from the fact that only bits and pieces of the range of alternatives in nuclear strategy are debated publicly.

After reviewing the commentary triggered by the action on a thin defense, one can only conclude that the public is ill-informed on several vital strategic factors. The extent of misinformation is serious. It is almost totally blocking public awareness of what lies ahead for the United States in the next twenty years.

For example: It is widely argued that installing any kind of a U.S. ballistic missile defense system—thin or thick—will generate a new arms race. Unfortunately, the opinion has become so widespread that there is a solid scientist/civilian administrator front holding the line against a missile defense on the grounds that it would lead to a new arms race. The adversary is pictured, not as the Soviet Union or Red China, but as a mythical and ill-defined U.S. "military-industrial complex."

The truth is that the United States and the Soviet Union have long been heavily engaged in the most rapid, expensive, and potentially most dangerous arms race in recorded history. Somehow, as the accusations fly over the "illogic" of the ABM, this central fact of our time is ignored.

Nothing short of an agreement on total disarmament can stop this race. It will churn on even if defensive missiles are never employed, even if the nuclear proliferation treaty is signed tomorrow. Nothing being done today by our government, the Soviet government, or any other government can head off this race.

The race centers on offensive weaponry, and it is being forced by the apparently unstoppable revolution in science and technology that is making every weapon obsolete before it can be deployed. There is no secret about the pace that technology is forcing. Long-range missiles have been operational

for only ten years; yet the first generation (Atlas and Titan) has been retired, the second generation (Minuteman I, II, and Polaris) is in service, development is well under way on the third generation (Minuteman III and Poseidon), and the fourth generation is well in the planning stage.

Officially, the need for most current improvements in these offensive systems is laid at the door of the Russians with their development of a missile defense. Somehow the idea has spread that our current offensive missiles in their silos and submarines are going to last a long time if the status quo can be maintained.

Two developments in offensive technology negate this idea. Massive changes in pace and direction must soon be made. The existing systems must be replaced almost entirely in the next decade if the U.S. strategic missile forces are to remain safe.

The first development is a three-way combination of guidance and mapping improvements and development of the cluster or multiple warhead. Satellite mapping has made it possible for the first time to locate targets with an accuracy of a few hundred yards. Today's guidance systems almost match this precision, while ten years ago they had an error of more than one mile after a flight of 5,000 miles. With current accuracy a small nuclear weapon can be used to knock out a missile buried in a hardened silo. When a series of such weapons is clustered in a single missile, it becomes possible for a relatively small offensive force to destroy large numbers of hardened missiles. Since Soviet ICBMs have heavy payloads, they stand to reap big benefits from this technology.

The eventual development of this situation comes as no surprise to the technical and military communities. Dr. Ralph Lapp warned in congressional testimony in 1960 that hard-target accuracy was inevitable. By 1962, scientists predicted in the open literature that such a capability would be here before the end of this decade.

The counteraction for improvements in guidance accuracy also have been discussed for years. One either builds harder silos, installs defensive missiles to protect the silos, or moves the offensive missiles out onto mobile carriers. The Air Force has asked that the fourth generation of ICBMs be mobile and has explained its requests to DoD and the Congress.

Satellite reconnaissance is the second technical development that will force multibillion dollar changes in offensive systems. It has been established through high-altitude aircraft experiments, as well as satellite flights, that several instruments operating simultaneously in the visible, infrared, and radio portions of the electromagnetic spectrum can show variations in the surface radiation patterns of land and sea well enough to reveal a great deal of what is going on underneath.

For example, certain underground rivers and tunnels can be spotted, and large bodies, such as schools of fish or submarines, can be "seen" under the water to a depth of more than 200 feet.

When this equipment reaches operational use in satellites, and it undoubtedly will in the 1970s, much of the submarine's protection will be gone. The only answer will be to build a new fleet of undersea boats which can operate at greater depths than those of today.

CASE FOR THE DEFENSE

The cause of misunderstanding on nuclear war strategy and the relative merits of offensive and defensive weapons can be traced back to one point on which there seems to be universal agreement. This crucial fact is that no foolproof, airtight defense against missiles is possible with today's technology or with foreseeable technology.

Two basic lines of thought have grown out of this situation. One is that only a per-

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fect defense is worthwhile in nuclear war, because even if only ten percent of the attacking warheads reach their targets they will wreak unacceptable devastation. According to this theory, it is most logical to put all resources in the offensive forces.

US nuclear policy has been built on this idea, and the objective, according to Mr. McNamara, has been to create an "actual assured destruction capability" that is "credible." That is, the US has built a force of offensive missiles so large there is no doubt it could withstand a first strike by any enemy, or combination of enemies, and still deliver such a blow to the aggressor that "his society is no longer viable in any meaningful, twentieth-century sense."

In this "all-offense" concept the only credible deterrence to nuclear aggression lies in the threat of an overwhelming counter-attack. A US ABM is considered a destabilizing force because it degrades the enemy's offense to some extent and forces him to install more attack missiles. And in any arms race, to gain a nuclear advantage the offense is in the favorable position because ICBMs are cheaper than an improved defense.

Opposition to a ballistic missile defense over the years has been voiced by such scientific policy advisers as Doctors Killian, Kistiakowsky, Wiesner, Hornig, York, Brown, and Foster—men who have served in the top science posts in the DoD and White House. The theory has been that a missile defense is of no real importance against nuclear powers at any stage of development, China included. The fact that the Soviets started installation of a defense system more than a year ago also is of no consequence. This, the anti-anti school holds, is simply a costly Russian mistake. In this theory the only viable deterrent to the use of nuclear weapons is the threat of an overwhelming counter-attack.

The ultimate objective of this policy is to work for and maintain a balanced nuclear deterrence between the great nuclear powers while seeking disarmament through negotiation.

A second nuclear strategy concept has developed which is in direct opposition to the one espoused by the United States until the decision last month to deploy a thin defense. In this second theory, missile defense has several beneficial roles, and it is a stabilizing rather than a destabilizing force.

The top US military authorities, a significant percentage of the US scientific community, and apparently the key men in the Soviet Union are exponents of this theory.

For the past two years, according to Gen. Earle G. Wheeler, Chairman of the Joint Chiefs of Staff, the JCS has recommended unanimously that the US deploy a missile defense that is stronger than the thin system now proposed by the Administration but less dense than the so-called "thick" defense whose price-tag is \$40 billion, spread over a ten-year period.

General Wheeler has been specific in presenting the reasons for the JCS view to the Congress. The Joint Chiefs fear that failure of the US to field an ABM will lead to Soviet and Allied belief that we are interested only in the offensive, that is, first strike, or that our technology is deficient, or that we will not pay to maintain strategic superiority. If the Russians are in sole possession of the ABM, it is considered possible that they may come to believe that their defense system coupled with a nuclear attack on the United States would limit damage to them to an acceptable level. While this acceptable damage level is an unknown, if it is ever reached our forces will no longer deter and the first principle of our security policy would be gone.

The JCS also believe that some form of ABM is needed to reduce the chances that a new nuclear power, such as China, could destroy several US cities at will with an un-

sophisticated missile force. Such a thin ABM also would provide a high probability that any missile launched by accident could be stopped.

Finally, the JCS believe that damage to US cities by a nuclear strike could be reduced in a meaningful way with an ABM system. General Wheeler, last February, stated that despite the mass destruction, "one nation will probably survive in a nuclear exchange. The thirty, forty, or fifty million American lives that could be saved by Nike-X, therefore, are meaningful, we believe, in every sense of the word."

Significant support for the JCS view exists in the US science community. All scientists do not accept the "all-offense" theory. In congressional hearings this year, Dr. Michael M. May, Director of the Lawrence Radiation Laboratory, strongly backed the deployment of an ABM. In an exchange with Sen. Joseph S. Clark (D-Pa.), Dr. May said that from the standpoint of deterrence it might make sense to put available funds into the offense rather than build an ABM. But, he added, "let me take up the question of what if war actually occurs; what if deterrence fails? In that case, even an imperfectly effective ballistic missile [defense] system with shelters will certainly save some tens of millions of lives. . . ." Senator Clark replied, "So what you are saying is, instead of having fifty million Americans killed you have only ten million Americans killed. . . . To me this is just nonsense." Dr. May disagreed completely, saying, "Not to me."

Soviet opposition to the all-offense theory has been repeatedly voiced by Russian military writers. Maj. Gen. N. Talensky was typical in writing in 1964, "It is said that the . . . situation cannot be stable where both sides simultaneously strive for deterrence through rocket power and the creation of defensive antimissile systems. I cannot agree. . . . Powerful deterrent forces and an effective antimissile defense system, when taken together, substantially increase the stability of mutual deterrence."

A number of US sources also have reported strong Russian favor for the missile defense concept. Richard B. Foster, Director of the Strategic Studies Center at Stanford Research Institute, wrote in 1966 that "the favorable Soviet attitude toward BMD [ballistic missile defense] was evidenced at the last three Pugwash Conferences. When Western spokesmen attempted to persuade the Soviet delegates that there were good reasons to refrain from developing BMD, the USSR representatives at first failed to understand the arguments. At the third conference they informed the Western delegates that it was too late; the USSR was going ahead with its BMD program."

Professor Freeman J. Dyson, a nuclear weapons expert and student of the Soviets, has said that it is "foolishly naive to suppose that any Soviet leader could be persuaded to forgo 'defense' for the sake of preserving 'deterrence.' Attempts from our side to pressure the Soviet government into abandoning deployment of ABMs would almost certainly backfire."

In view of such reports from outside the government, it is curious that insiders could convince themselves in November 1966 that the Russians could be talked into a ban on missile defenses, long after deployment of their BMD had begun. At any rate the talks failed and the US belatedly is following the Soviet lead.

To sum up, military men generally believe it is incorrect to put emphasis on casualties when the central objective is to avoid all casualties by deterring war. The aim should be to develop a war-winning capability with a balanced offensive/defensive force ready for combined operations that will minimize our damage while maximizing the enemy's. Possession of a combined force, war-winning

capability is considered the best deterrence to enemy action. If the US went for the 100 percent offensive force, there is no way it could limit the damage inflicted by the enemy except by a first strike.

THE FUTURE OF THE ABM

Most commentators opposing the ABM have echoed Mr. McNamara and warned that the greatest danger in installing the thin system is that there will be a temptation to seek more protection and to expand it into a heavy defense. And, according to the Defense Secretary, this temptation will lead to a "senseless spiral upwards of nuclear arms," in which huge sums would be spent, with neither side buying more protection for its people and both running the risk of having more megatons of explosive strike its soil.

To anyone who questions the logic of the "all-offense" theory, there is a greater concern for the future. This worry involves the pace of technology and the major improvements in weapon systems that will be forced in the next decade. Defensive systems face innovations just as revolutionary as the ones previously described for offensive missiles.

Briefly, the two most important components in the ABM—the radar and the kill mechanism—apparently are in a period of accelerating improvement with no end in sight. The first major upgrading in radar was the ability to track hundreds of objects rather than a single warhead. The early Nike-Zeus radar was mechanically slewed and required seconds to look at each target. It proved many important technical points and knocked down ten out of fourteen ICBM warheads during 1962-1963 tests, but it was at a serious disadvantage against mass attacks with decoys supporting the warheads. This limitation was relieved with the Nike-X phased-array radar, which can sweep the entire sky with its electronically steered beams in microseconds. Future developments are aimed at higher frequency devices which will reduce the radar blackout time following the detonation of large nuclear weapons in the upper atmosphere. Another objective is to improve multispectral methods of sorting warheads from decoys.

Nuclear weapon development is in its most revolutionary period. For several years both the US and USSR have been working on pure fusion weapons, often called neutron or N-bombs. S. T. Cohen, of the RAND Corp., last June wrote of the fact that these weapons use nuclear processes which emit no radioactivity and shower forth neutrons of a "unique nature" with sufficiently high energy to permit "new domains of utilization." One of the practical results of this new technology is that designers can improve the capacity of nuclear weapons to stop ICBM warheads. Another effect of the new technology, according to Mr. Cohen, is that the cost of nuclear weapons will drop sharply.

Very large warheads also are being investigated for the ABM system because it was found that the original US scaling theory was inaccurate and that very large weapons probably produce 1,000 times more neutrons than was estimated a few years ago. As the effectiveness of the defensive warheads is increased, a system can approach the point where each defense weapon can take out more than one ICBM warhead.

One of the stickiest technical facts that must be faced in the next 10 years is that space operations can materially increase the effectiveness of an ABM system. The optimum vantage point for observing and tracking an ICBM strike is out in space where the launch can be seen and the entire thirty-minute flight followed. Observing from space is a substantial improvement over the current system of sitting in the target area and picking up the warheads in their terminal dives. Present-day moving target indicators and other tracking equipment could handle the observation-from-space task admirably, and undoubtedly improvements can be made.

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Space operations offer the additional possibility of attacking an ICBM strike along its entire route, during the boost and midcourse phases as well as the terminal. Defensive warheads positioned in space could be brought down on command to form a "mine-field" before the attacker. Many other schemes are possible.

Without doubt, talk of a spaceborne component of the ABM system will bring immediate and loud objections from anyone who embraces the "all-offensive" theory or from anyone who is concerned about an expansion of the thin defense and fears the cost of space operations. Still, there is no escaping the fact that rapid, constant change, in military systems as well as in everything else, is a part of our life. Technology is forcing it.

One of the great expectations is that the technical revolution will lead to stronger defenses. Somewhere in the unforeseeable future, a decade or so ahead, if man is persistent enough, he should be able to build a defense that will all but neutralize the nuclear offense.

Effectively, man has two roads for seeking a way out of the nuclear dilemma. The first is with science and technology—the areas that started the trouble in the first place. The second is through negotiations to see if national governments can talk themselves out of their ancient antagonisms and current fears. Both of these efforts are vital to building a world safe from nuclear catastrophe. Perhaps neither could ever do the job alone.

It is difficult to see how peace would be served for the US and USSR to seek a *status quo* and wait for China, and possibly other nations, to creep ahead with the development of an "assured-destruction capability" with the power to annihilate all whom they consider to be an enemy.

In any event, it is impossible to see what purpose is served by leaving the impression that the US is helping to precipitate an arms race by belatedly okaying a thin ABM system while the Soviets are already beyond that stage and at work on a heavy model. Mr. McNamara, in his announcement, fueled critics of the military to overflowing by leaving the impression that he was being pushed into approving the thin system and would never alter his opposition to a further expansion of the defenses.

At this stage in the technical revolution it would seem mandatory for the Secretary of Defense to make it clear that we are far from the end of the line in strategic arms, and that the fifth and sixth generations of long-range missiles and a heavier defense may be necessary in the next decade. No one would expect the Secretary to present a long shopping list of exotic new space and weapon systems. But he should at least create a climate in which all new systems are not viewed as part of a vast military-industrial plot. Such a climate is necessary to public acceptance of the thin ABM for what it is, a necessary step in the twenty-year-old US-USSR arms race that cannot be terminated without a near-miracle in negotiation or a technical breakthrough comparable to the first atomic weapon.

Mr. THURMOND. Mr. President, recently the Senate Preparedness Investigating Subcommittee held hearings on offensive and defensive strategic weapons and weapon delivery systems. The results of these hearings are not yet available, but I can assure Senators that the need for antimissile defense was carefully explored. I should hope that any Senator who might be inclined to delay the deployment of the Sentinel system would, before he votes on the defense appropriation, contact the Senate Preparedness Subcommittee and obtain a copy of the hearings showing the hazards that such a delay would involve.

Mr. President, in concluding my comments in defense of the Sentinel system, I should like to summarize. I have pointed out the grave consequences of any delay in the deployment of the Sentinel system. I have reviewed the history and the threat against which the ABM defends. I have presented the case for this defense and have cited the Preparedness Investigating Subcommittee hearings on strategic offensive and defensive weapons systems as the authority for continuing with the Sentinel deployment. I urge the Senators to familiarize themselves with this entire problem before taking any precipitate action in reducing defense appropriations when the money bill comes before the Senate.

It has been estimated that if an all-out war should occur, an antiballistic missile system could save from 80 million to 100 million lives. Taking into consideration the tremendous jeopardy that could result to our Nation because of the loss of millions of lives as well as the loss of hundreds of millions of dollars worth of property, it would seem the part of prudence not to delay in going forward with an antiballistic missile system. Military experts believe we should go forward without delay. In fact, they further advise that we go further with the full system, not merely with a thin system, with which the Department of Defense is now proceeding. However, the thin system will lay the base to proceed later with a complete system that would be a defense against the missiles of the Soviet Union.

PERSONAL PRIVILEGE

Mr. DODD. Mr. President, I do not like to detain the staff or other Senators, but I believe this matter is so important that I must do so for a little while tonight.

This morning, Drew Pearson and Jack Anderson made their latest attack against me, and it appeared in many of the morning newspapers across the country.

Pearson's vendetta against me began when I first entered the House of Representatives approximately 14 years ago, and this morning's column is the 123d which he has written condemning me. He has accused me of almost every imaginable impropriety and wrong and now he has gone even further by saying that even in the area in which I have fought the hardest, and to which I have dedicated much of my senatorial career, I am not honest and, in fact, have been working against the public interest.

Pearson's lying attacks upon me no longer hurt me. I believe I am beyond that point. They no longer anger me. But the charge of this morning appalled me and amazed me, because it was so incredible, so totally inaccurate, so blatantly false.

While all of his charges against me have been untrue, the falsity of many of them has been difficult for me to prove, because, unfortunately, there has not always been sufficient evidence and documentary proof of the truth. With respect to this morning's charges, however, I am in possession of overwhelming proof that Pearson is what all knowledgeable Amer-

icans know him to be—an unmitigated and scandalous liar.

Today, Pearson and Anderson and their lying, thieving jackals charge that I, while pretending to vigorously work toward curbing violence among the young people of our country, have actually been working in the opposite direction—specifically, by suppressing a Senate Juvenile Delinquency Subcommittee study of the impact of television crime and violence on our young people. I quote what he wrote:

These (television) studies, written more than six years ago, were suppressed, ironically, by the same Senator Tom Dodd (D-Conn.) who introduced the gun control bill to curb violence.

He goes on to quote from a series of memorandums written by members of the staff to me about the substance of these studies, and claims that all of these, as well as the study itself, were suppressed.

Pearson claims that my motive was my desire not to embarrass the powerful television networks.

Mr. President, all these charges are completely false and an incredible distortion of history. Here is the real truth and the real proof. Fortunately, I have it. As chairman of the Subcommittee on Juvenile Delinquency, I have been concerned with violence since 1961. For the first 3 years, I dedicated myself to the problem of violence on television and its potential effect on the public and on young people.

From 1963 on, I have been interested in stronger gun control legislation.

Between 1961 and 1963 I did conduct—and the record will establish that I did—an intensive investigation of crime and violence on television.

During this period we held many days of hearings. The hearing record is here. It is voluminous. Many, many witnesses appeared. The foremost experts in psychiatry and criminology and in the television industry.

In all, we heard from 56 witnesses, and on my desk are the records, which I hope every Member of the Senate will read. They were printed and released to the public and to the press in the usual way. Finally, on October 27, 1964, with the approval of the majority of the subcommittee, I made a public and thorough and comprehensive report on crime and violence on television and its impact on our young people.

We released 10,000 copies of that report. It was released to the public. I do not know how it could have been done better.

That this unforgivable liar can claim that I suppressed this investigation, in the face of these facts and documentary proof, is utterly beyond my comprehension. I try to be a gentleman. I want to be. But so many lies have been told about me, and so many people have believed them, that my patience is broken.

But Pearson himself is beyond comprehension in the depths to which he will sink and the outrageous lengths to which he will go to assassinate the characters of those whom he hates. He hates me. I do not hate him. I am sorry for him; but I feel it is incumbent upon me, for my-

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self, for my family, and for my friends that the record be written straight.

The crowning proof of this morning's lies by Pearson and Anderson is Drew Pearson himself in an article which he wrote just 13 days after the release of this subcommittee report.

In that column of November 9, 1964, he praised me for releasing this report and uncovering the truth about the violent nature of the television network programs.

I would think that it would behoove irresponsible and lying columnists such as Anderson and Pearson to at least remember what they have written and said in the past. But when a person starts to lie, he gets in trouble because he cannot remember the lies he told.

And I have always felt that it was inevitable that Pearson and Anderson who lie to the degree that they do, would sooner or later get caught up in their lies.

I want to briefly quote from this 1964 Pearson column:

The current report by Senator Tom Dodd (D-Conn.) on juvenile delinquency shows that some of the networks are serving just as brazen a crime diet as ever. And since the people of California have set a precedent that individual Americans cannot see entertainment they pay for, it might be well for the rest of the country to diagnose carefully what it is getting free.

The Senate Juvenile Delinquency Committee dug into the secret files of the American Broadcasting Company to get its inter-office memos, some of them pertaining to "The Untouchables." This is a show originally watched over a five-year period by 5,500,000 children a week. (It is no longer on the ABC network.)

Ironically, these are some of the very memos which Pearson claims in this morning's column were suppressed by me.

Let me quote from another Pearson column, which appeared on August 19, 1964.

For various reasons, it looks as if television is going to be up against the congressional gun this year.

Sharpshooter No. 1 is Sen. Tom Dodd (D-Conn.), who blames television for our scandalous juvenile delinquency increase. He is supported by Sen. Ken Keating (R-N.Y.). In tough language they have warned the networks that there's been absolutely no change in the diet of crime and sex being dished out to the public—especially by NBC and ABC.

This highly important television study, which Pearson, Anderson, and their jackals and thieves would have the American public believe I suppressed, resulted in many significant findings. I want to briefly review some of the more important ones for the RECORD.

First. Normal people who view violence on film exhibit twice as much violence thereafter as persons not exposed to such presentation. This was proven by scientific experimentation.

Second. Television programs which feature excessive violence tend to reinforce overly aggressive attitudes and drives in juvenile viewers where such attitudes and drives already exist.

Third. Children can be taught to perform aggressive acts by being exposed to such acts on television.

Fourth. Continuous exposure of the young to programs containing violence, crime, and brutality tends to produce a cumulative effect which can build up aggressive tendencies and the viewers' acceptance of excessive violence as the normal way of life.

Fifth. Filmed violence can serve as the motivation for the release of hostility and aggressive behavior in some individuals already under stress for other reasons.

In this report I was highly critical of the television industry and I warned the industry that it had to cut the amount of violence and crime on its programs or face congressional intervention.

I have often repeated this criticism, and as recently as last Tuesday, on the floor of the Senate, I described the results of this important study.

Nothing means more to me, there is nothing closer to my heart, nothing to which I have dedicated more time than my campaign, and, persistent efforts to investigate the causes of violence in our society, particularly among our young people. This was the reason for my efforts to see that we have strict gun control legislation enacted. This was the reason for the television study. It brought me a lot of trouble. But that never bothered me.

However, Pearson lied again this morning when he challenged my sincerity in this regard and impugned my integrity with respect to this most important aspect of my career in the Senate. But this is just another example of the countless lies, misrepresentations, and distortions made by this man and his associates against me. I shall have more to say about the subject. It may take a few days, but I am preparing to do it.

Drew Pearson is a liar. He is a monster. Someday the American people will recognize it. Those associated with him are thieves, liars, and monsters. Someday the American people will recognize it. His business is lying. He is a devil.

It appalled me that he was honored as a Big Brother; a molester of children who had the records of his arrest destroyed. What is his strange power in this Government?

I said on another occasion he is the Rasputin of our society, and he is. I do not know what his influence is.

I know he had the affrontery to call me and ask me to vote against Mr. Bress as U.S. attorney for the District of Columbia. One of my colleagues brought the memorandum to me and asked me not to say who gave it to him. I told him I must know and he said, "It is Pearson."

I have been learning more about Pearson and Anderson and their lying and thieving associates than perhaps any other man in this body. I am going to put it in the RECORD.

They should be put away. They prey on the frailties of human nature, and they get evil things done.

Mr. President, this is not the last thing I am going to have to say on this subject. I am, as I said, at the breaking point in my patience and I am going to tell all I know about them. It is going to shock the Senate, it is going to shock this coun-

try, and it is going to shock the world. I have some pretty good evidence.

He has caused more men to destroy themselves than perhaps any other man in my time. He is not going to cause me to do so. He will ruin you, Mr. President (Mr. Long of Louisiana in the chair), and every Member of the Senate if you do not serve his purpose. He is the Devil's own slave. He does not know honor. He does not know truth. He is a monster and his jackals are just as bad.

Mr. President, I am sorry for this delay.

I ask unanimous consent to have printed in the RECORD two articles written by Drew Pearson.

There being no objection, the articles were ordered to be printed in the RECORD, as follows:

[Nov. 9, 1964]

WASHINGTON MERRY-GO-ROUND

(By Drew Pearson)

WASHINGTON.—Now that California has elected a song-and-dance man to the Senate and simultaneously killed the right of its people to see pay-as-you-go television, it should be up to the TV networks to improve the quality of their programs.

However, the current report by Sen. Tom Dodd (D-Conn.) on juvenile delinquency shows that some of the networks are serving just as brazen a crime diet as ever. And since the people of California have set a precedent that individual Americans cannot see entertainment they pay for, it might be well for the rest of the country to diagnose carefully what it is getting free.

The Senate Juvenile Delinquency Committee dug into the secret files of the American Broadcasting Company to get its inter-office memos, some of them pertaining to "The Untouchables." This is a show originally watched over a five-year period by 5,500,000 children a week. [It is no longer on the ABC network.]

Here is one ABC inter-office memo describing the blood-and-guts proposed for these viewers:

"Opens right up . . . a running gunfight between two cars of mobsters who crash, then continue the fight in the streets. Three killed. Six injured. Three killed are innocent bystanders . . .

"There's a good action scene where the mail truck is held up and the driver killed. "Colbeck suspicions it was Courtney and beats it out of Joe's henchman. Courtney is trapped in an alley and beaten unconscious and tossed in the river. . .

"Colbeck pressures a police lieutenant who owes him a favor to pick up (Courtney's) gal and deliver her to a spot on the bridge where Colbeck's men will shoot her dead."

On one occasion, ABC program people advised ABC president Tom Moore that there is a tendency of recent episodes to become "talky" and as a result much of the action and suspense is lost. Moore then wrote producer Quinn Martin:

"I hope you will give careful attention to maintaining this action and suspense in future episodes. As you know, there has been a softening of the ratings, which may or may not be the result of this talkiness, but certainly we should watch it carefully."

Martin is known in the trade as a "blood-and-guts" producer. Regarding another show, "A Killer Called Paddy-O," Martin wrote this memo marked "personal and confidential":

"I wish we could come up with a different device than running a man down with a car, as we have done this now in three different shows.

"I like the idea of sadism, but I hope we can come up with another approach for it."